APPLIED HYDRAULICS

MAY 1955

THE MAGAZINE OF
FLUID POWER
INCLUDING AIR CONTROLS
AND AIR CIRCUIT DESIGNS
• ELECTRICAL CONTROLS •

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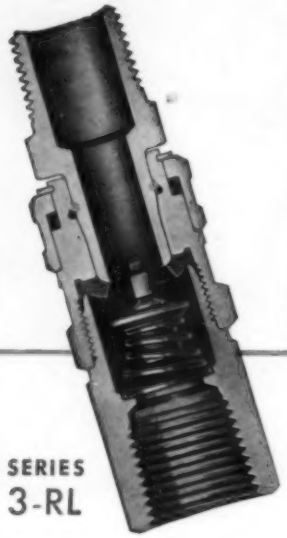
FRANCHISE CIRCULATION

For information about
the APPLIED HYDRAULICS 1955 Prize Paper Contest
see page 153

Everything You Want

in a Quick-Connective Pneumatic Coupling



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Compactly designed, the Hansen Series 3-RL Coupling *effectively* handles far more volume than any coupling of equal dimensions. On any job requiring ¾" to ⅛" connections—from the air line to the air tool—this single size Hansen Ring-Lock Coupling—with completely interchangeable Sockets and Plugs—does it all—makes it easy to keep stock of parts in balance—holds inventories to a minimum.

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- Smaller.
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- Positive locking.
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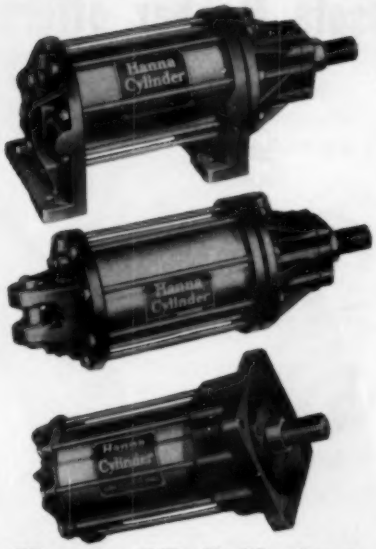

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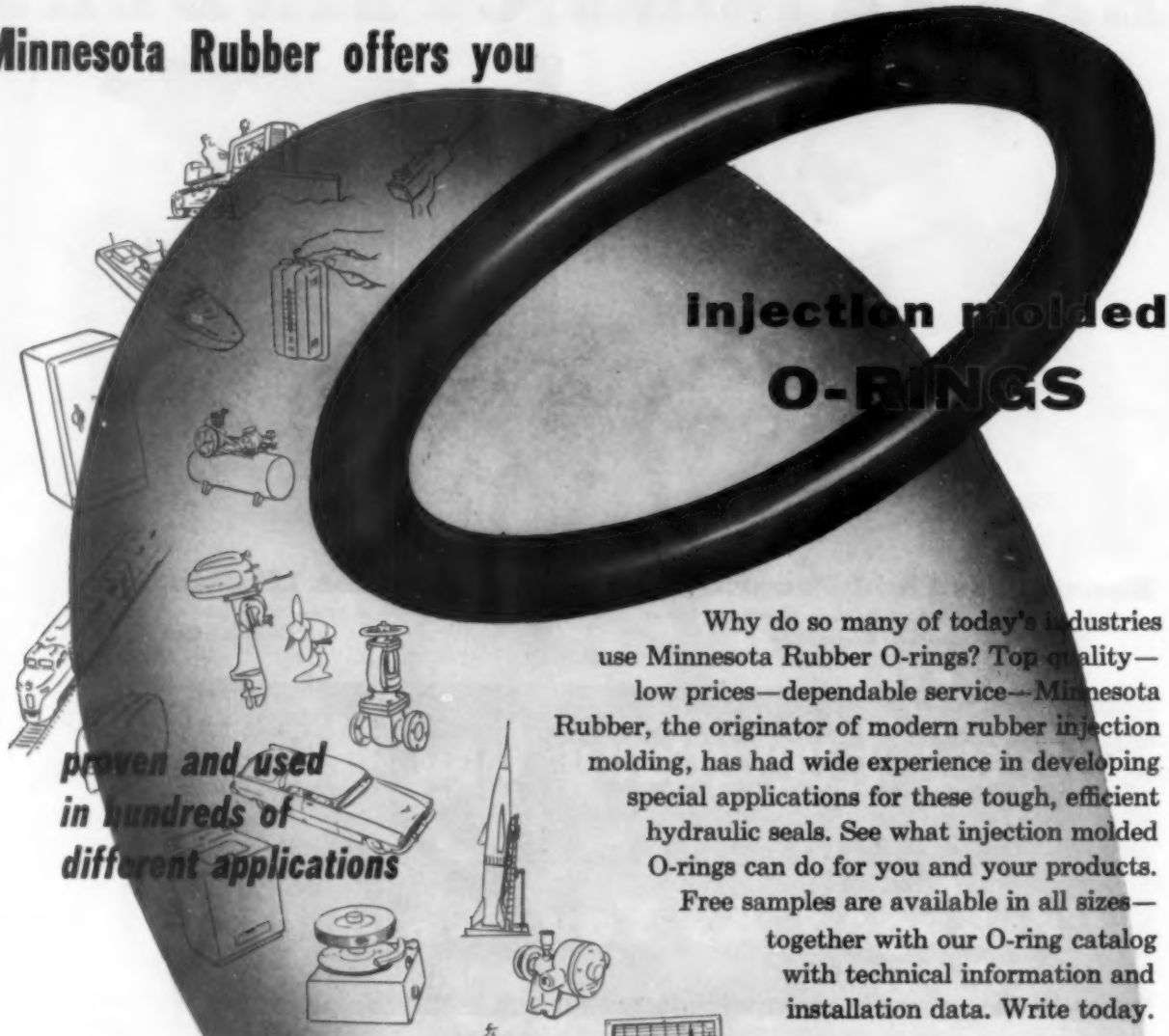

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APPLIED
HYDRAULICS

VOLUME 8 NUMBER 5

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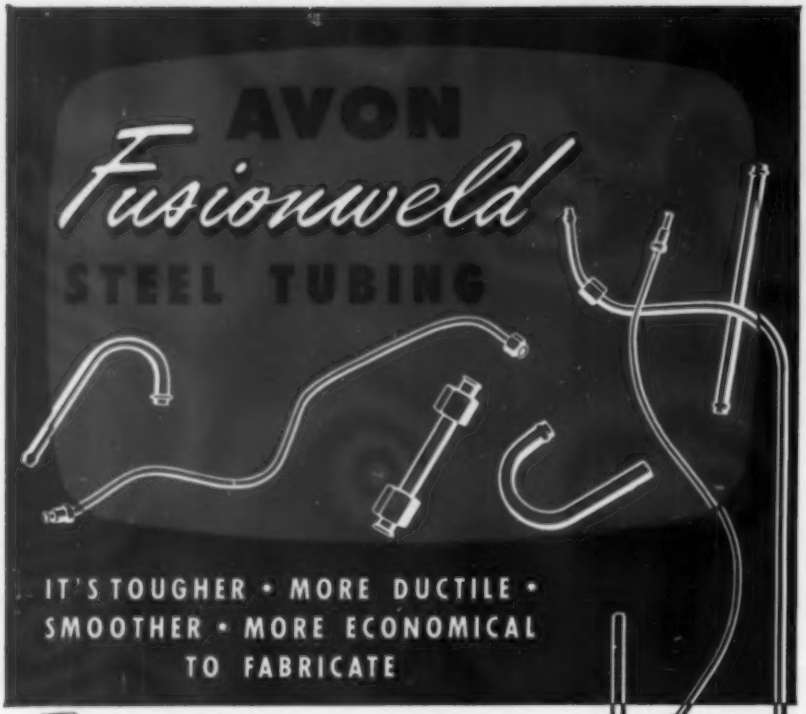

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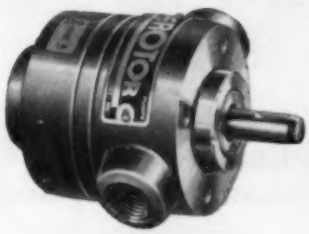
There's a GEROTOR HYDRAULIC PUMP *to meet your requirements!*

The GEROTOR line of precision engineered hydraulic pumps is designed to fill the requirements of the majority of hydraulic equipment users. The three standard GEROTOR models cover a range of g.p.m. delivery from .4 g.p.m. to 40 g.p.m. Check the selection data for the pump to fill your needs.



TYPE QDB

Gerotor's NEW QDB series of small capacity pumps . . . the last word in precision engineering.

DELIVERY G.P.M. — 1800 R.P.M.					
TYPE	DISCHARGE PRESSURE P.S.I.				
	0	250	500	750	1000
QDB .4	.42	.40	.38	.35	.31
QDB .75	.84	.80	.78	.73	.66
QDB 1.5	1.67	1.62	1.57	1.50	1.42

Selection Data

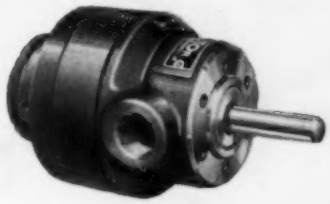
HORSEPOWER REQUIRED — 1800 R.P.M.					
TYPE	DISCHARGE PRESSURE P.S.I.				
	0	250	500	750	1000
QDB .4	.08	.16	.24	.33	.41
QDB .75	.13	.27	.41	.56	.71
QDB 1.5	.16	.42	.70	1.00	1.28

PRESSURE—Maximum continuous operating pressure is 1000 p.s.i.

SPEED—Standard design speed is 1800 r.p.m. Specific recommendations are made for applications at other speeds.

ROTATION—Standard rotation is clockwise facing shaft end. Counter-clockwise rotation is available.

OIL—Hydraulic oils with viscosity of approximately 300 s.s.u. at 100° F. are recommended.



TYPE QDH

The QDH . . . popular intermediate size of the Gerotor line

DELIVERY — G.P.M. AT 1200 R.P.M.							
TYPE	DISCHARGE PRESSURE P.S.I.						
	0	250	500	750	1000	1200	1500
QDH 3	3.3	3.2	3.1	3.0	2.9	2.7	2.5
QDH 5	5.6	5.4	5.3	5.2	5.1	4.8	4.4
QDH 8	8.6	8.5	8.4	8.3	8.2	8.1	7.8
QDH 12	12.9	12.8	12.7	12.5	12.3	12.2	11.8

Selection Data

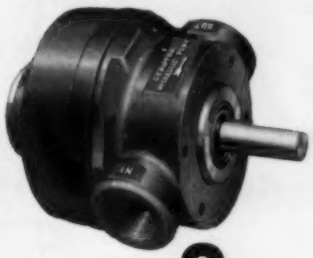
HORSEPOWER REQUIRED AT 1200 R.P.M.							
TYPE	DISCHARGE PRESSURE P.S.I.						
	0	250	500	750	1000	1200	1500
QDH 3	.25	.7	1.2	1.6	2.1	2.5	3.4
QDH 5	.33	1.1	1.8	2.5	3.2	3.7	4.6
QDH 8	.4	1.5	2.7	4.2	5.4	6.3	7.9
QDH 12	.5	2.3	4.2	6.1	8.0	9.6	11.7

PRESSURE—Maximum continuous operating pressure is 1200 p.s.i., maximum intermittent 1500 p.s.i.

SPEED—Standard design speed is 1200 r.p.m. Specific recommendations are made for applications at other speeds.

ROTATION—Standard rotation is clockwise facing shaft end. Counter-clockwise rotation is also available.

OIL—Hydraulic oils with viscosity of approximately 300 s.s.u. at 100° F. are recommended.



TYPE O

Gerotor Series O . . . when larger capacities are needed

DELIVERY — G.P.M. AT 1200 R.P.M.					
TYPE	DISCHARGE PRESSURE P.S.I.				
	0	250	500	750	1000
O-20	20.0	19.5	18.8	18.0	17.2
O-25	25.0	24.5	24.0	23.2	22.2
O-30	31.2	31.0	30.5	29.8	29.0
O-40	43.0	42.5	42.0	41.5	40.0

Selection Data

HORSEPOWER REQUIRED AT 1200 R.P.M.					
TYPE	DISCHARGE PRESSURE P.S.I.				
	0	250	500	750	1000
O-20	1.0	4.0	7.2	10.5	13.5
O-25	1.5	5.0	8.6	12.0	15.6
O-30	2.0	6.5	10.9	15.5	19.5
O-40	3.0	9.0	15.0	21.0	27.5

PRESSURE—Maximum continuous operating pressure is 1000 p.s.i., except type O-40, which is recommended for only intermittent duty at 1000 p.s.i.

SPEED—Standard design speed is 1200 r.p.m. Specific recommendations are made for applications at other speeds.

ROTATION—Standard rotation is clockwise facing shaft end. Counter-clockwise rotation is available.

OIL—Hydraulic oils with viscosity of approximately 300 s.s.u. at 100° F. are recommended.

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(Cartridge Type) 350-5,000 p.s.i.

SIZES	¼"	⅜"	½"	¾"
G.P.M.	3	6	10	20

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—02	1,000-2,300 p.s.i.
—03	2,300-5,000 p.s.i.

Cartridge design permits rapid servicing without breaking line, thus reducing downtime and maintenance costs!

Pilot integral part of main valve • no chatter, squeal, or wire-drawing • unprecedented *repeat* accuracy throughout pressure and flow ranges • opens and closes with 10% differential • wide temperature range, from — 65°F to + 160°F • right angle port arrangement • mechanite body, stainless steel working parts. All models are available with external adjustment and locking thumbscrews.

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¼" Directly-Operated 4-Way Valve

Solenoid Controlled—100-5,000 p.s.i.

Port Size: ¼" Only

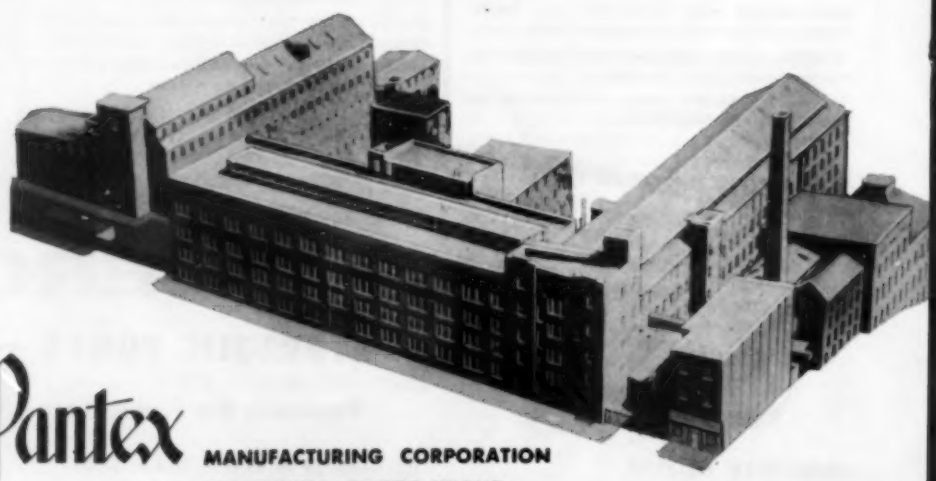
Flow Rate: 1¼ g.p.m. recommended

Types Available: Single solenoid with spring offset spool, *double solenoid* without spring, and also *spring-centered spool*. Available in 12 different assemblies of subplates, spool types, spool springs and solenoids.

Interchangeable with most low pressure valves. Compact bottom or side entry sub-plates. Low inrush coils quickly replaced. Models also available which are completely dustproofed, and will not operate with covers removed.

Write for Bulletin 25.

Photo of the 250,000 sq. ft. Pantex plant at Pawtucket, Rhode Island



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3/4" Pilot-Operated 4-Way Valve

Remotely Controlled—100-5,000 p.s.i.

Port Size: 3/4" Only

Flow Rate: 20 g.p.m. recommended

Types Available: Spring offset, spring centered and no spring. Available in 24 different assemblies of varying sub-plates, spool types, and spool springs.

Hollow spool design for true open center and tandem use • extremely compact, can be mounted close to cylinder • controlled with hand, cam, or other pilot valve • easily mounted on existing installations where higher pressures are desired. Also available with spool stroke adjustments for controlling flow rate thru valve.

Write for Bulletin 57.

3/4" Pilot-Operated 4-Way Valve

Solenoid Controlled—100-5,000 p.s.i.

Port Size: 3/4" Only

Flow Rate: 20 g.p.m. recommended

Types Available: Single solenoid with spring offset spool. Double solenoid with no spring and also spring centered spool. Available in 24 different assemblies of varying subplates, spool types, spool springs and solenoids.

Detachable coils, quickly, inexpensively replaced • low inrush ampere factor • can be used in tandem • extremely compact • hollow spool design for true open center. Also available with pilot choke for controlling reversal time and/or spool stroke adjustment for controlling flow rate.

Write for Bulletin 55.

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Fluid Power Lines

about Applied Hydraulics

Valve Panels

What's the best way to make a valve panel? There are at least four distinct types—brazed sandwich, cemented sandwich, drilled block, and welded panels—and then in each type you can come up with many variations.

Which one you choose depends on too many factors to list here—so we'll take the easy way out and say "a lot depends on the application". However we aren't leaving you high and dry on this selection problem. This month on page 65 you'll find an excellent article on welded manifolds by Harry Brown and Jim Smith of National Acme. We've also included a bibliography of articles about the other types of panels.

"Take a tube to Jersey"

This too is done with hydraulics! When you drive through the new tube of the Lincoln tunnel between New York City and New Jersey, which will be put in operation early in 1957, remember that hydraulics put it there, 75 feet below the Hudson river. This construction method isn't new, but midwesterners like us are easily impressed by the size of the job which is described on page 116.

We look up at skyscrapers too.

What's a Relay?

Try this question on yourself and your engineering buddies. You can probably come up with at least five distinct answers which bear little relationship to each other. What prompts us to suggest this startling quiz is the article on page 77 which tells about the selection of electrical controls on an air powered production machine. Control and timing relays play a big part in the design of this equipment.

However, to win the quiz prize, the correct answer is a race involving men and a baton.

Settle on 3000 psi

In this month's Aviation Section, you get a firm and authoritative answer to the question: "What's the best pressure for aircraft hydraulic systems?" The article by Conrad Cooke is based on a technical report prepared by Cooke, Eugene Gessner and Robert L. Smith of the Glenn L. Martin Company. Prepared under contract for the Wright Air Development Center, this report, with its charts and graphs, fills two thick volumes. Conclusion: 4000 psi is the optimum level, but today it doesn't pay to change from the 3000 psi circuit.

Oil Driven Water Pump

The article by Bud Killa, of Ladish Company, describes a circuit which we believe to be entirely new for powering forging presses. The large air-to-water accumulators are charged by an oil driven converter. Why was this installation made? For greater safety, and lower maintenance. The advantages of both oil and water have been combined.

Small Package—Big Push

. . . that's what was wanted by the designers of a device for reclosing giant electric circuit breakers. Of course hydraulics is the answer. But the device was by no means simple to work out. E. R. Perry of Allis-Chalmers details the design which includes a special triggering valve which is the "brains" of the unit.

How's Your Inertia?

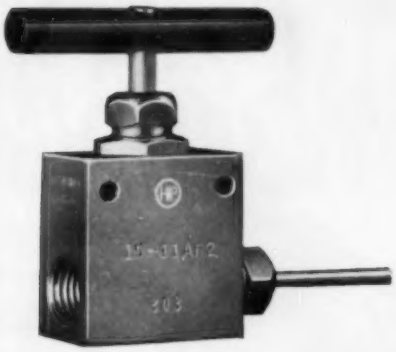
My grandfather always reminded me that only moving bodies had inertia and if I could get mine in motion maybe sheer inertia would get me where I wanted to go. Since I am perfectly comfortable sitting on the end of a pier with the sunshine, a lunch pail and fishing pole with an empty hook, grandfather's sound engineering has had very little effect on this grandson.

However, for all of you who have your eyes on the $1200 in cash awards which APPLIED HYDRAULICS will give to winners of the 1955 Prize Paper Contest, maybe grand dad's thought on inertia will help. The contest closes July 1st.

You can write your paper on any subject which you believe will make a suitable article for APPLIED HYDRAULICS. Good illustrations help a lot. The paper need not be long—take a look at the articles in this issue.

Top winners will receive awards in October at the National Conference on Industrial Hydraulics.

Precision "O" Ring holds 15 tons pressure in this HIP Midget Valve!



ACTUAL SIZE!

Versatile and compact Needle Valves, by High Pressure Equipment Company, Erie, Pa., use **Precision "O" Rings** to do the vital sealing job which keeps these midgets leak-proof. Pressures—0 to 30,000 PSI!

Precision "O" Rings—always quality controlled, tough, compression molded—your assurance of top, trouble-free performance. Let our engineers help solve **your** sealing problems with the finest "O" Rings made!

Valve body so small—hides behind a 50c piece.

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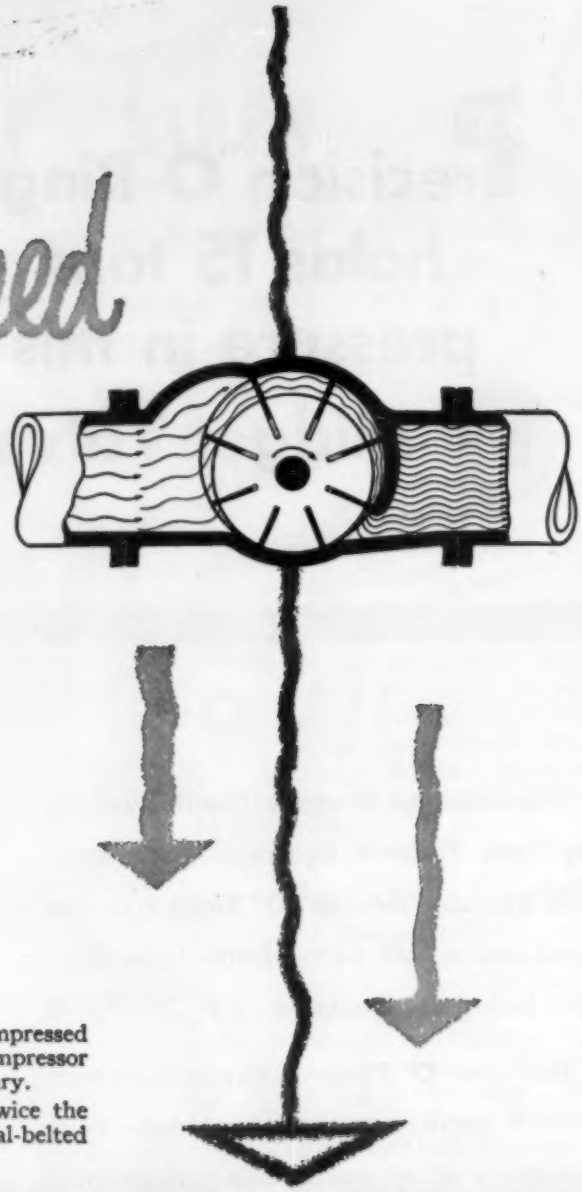
When you need more AIR



When you require additional compressed air—and available space for a compressor is at a premium—try a Fuller Rotary.

Because it is a Rotary, it has twice the capacity of a comparative horizontal-belted reciprocating unit.

Because it is a Rotary, it is singularly lacking in vibration and requires only a nominal foundation.

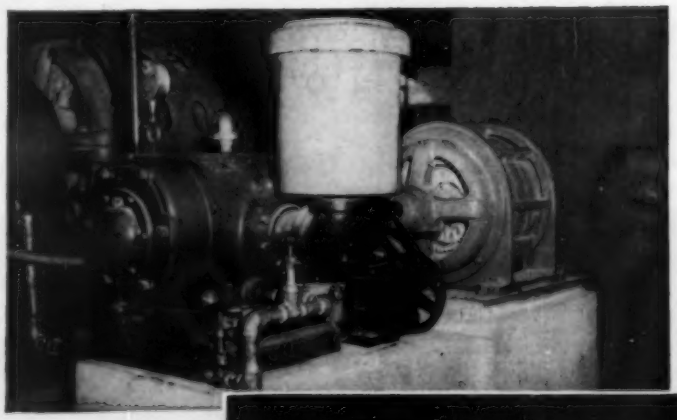
Because it operates at normal speeds, it is direct-connected and requires no cumbersome reduction gearing or belts.

Because of these things, you can put a Fuller Rotary in almost any unused corner, or on a balcony, or even suspended from the rafters, if need be.

So, whenever you are cramped for space and air, you can ease your problem by specifying Fuller.

Pressures to 125 psig; capacities to 3300 cfm.

Detailed information on design characteristics and typical applications will be forwarded promptly on request.



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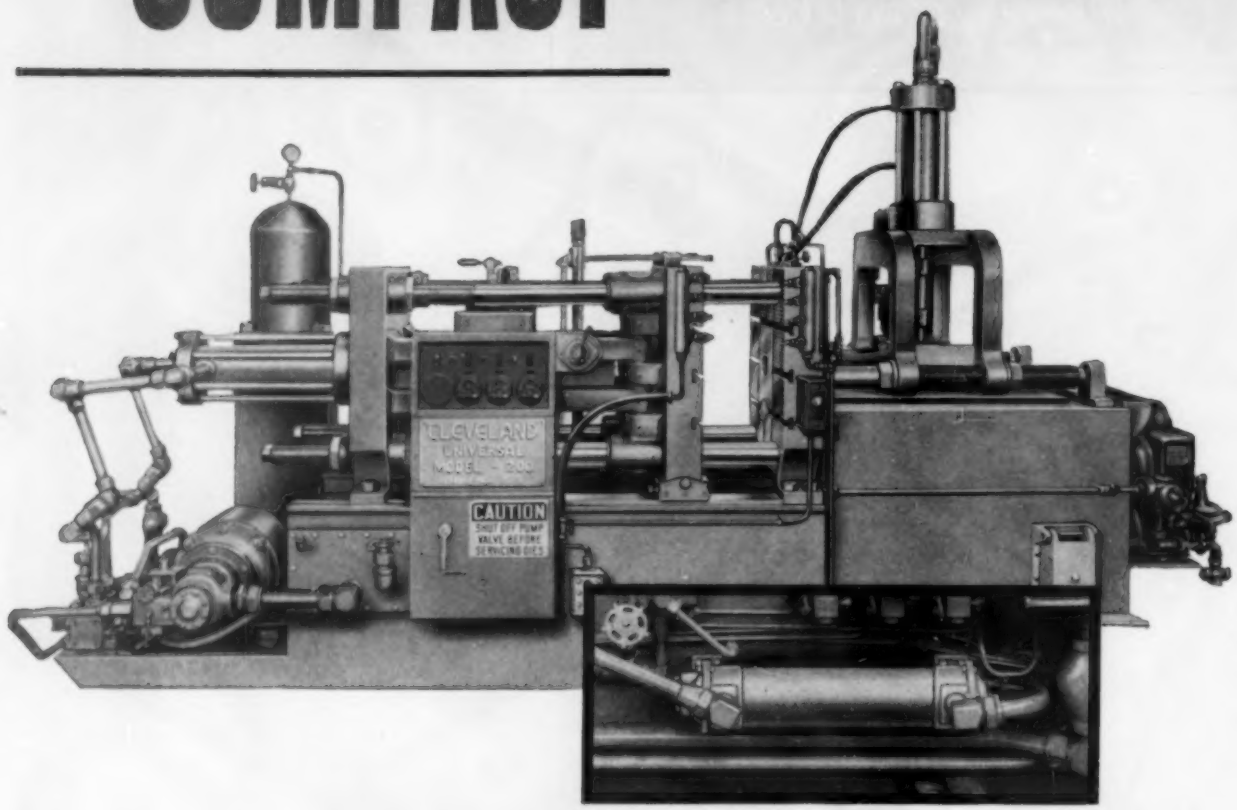
COMPACT ROSS EXCHANGERS



Insure rated pressures of Cleveland Die Casting Machines

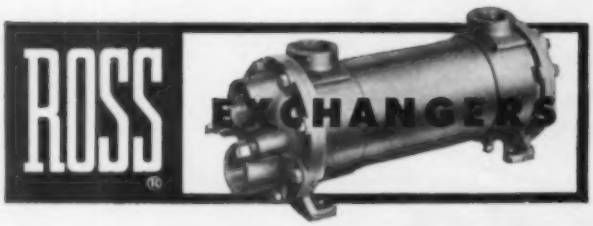
With its hydraulic system designed to provide fast injection speed as well as the "squeeze" at the end of the shot, this Cleveland Model 200 Die Casting Machine has a rated locking pressure of 200 tons.

To maintain full capacity of the machine's high-pressure, two stage pump by preventing slippage from overheated, thinned, hydraulic oil, a Ross Type BCF Exchanger has been factory-installed. *Dependable cooling is assured!*

"All models of Cleveland Die Casting Machines use Ross Exchangers because we have found them very efficient in keeping the temperature of the hydraulic fluid constant at all times. Furthermore, the size of the Ross Cooler lends itself to easy mounting on our machine," says The Cleveland Automatic Machine Company.

Unrivaled for thermal efficiency and ruggedness, all copper alloy Ross Type BCF Exchangers are preferred for numerous types and makes of hydraulic machinery. Pre-engineered and fully standardized, they are stocked in a wide range of sizes to meet your needs . . . *promptly*.

For detailed information, request Bulletin 1.1K5.



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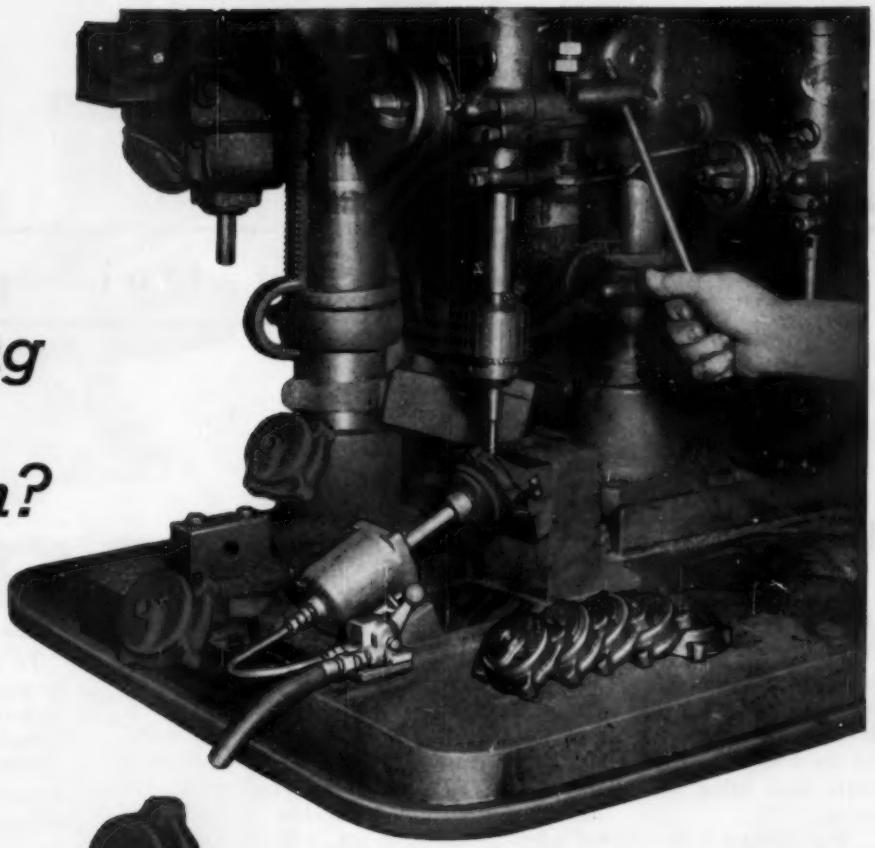
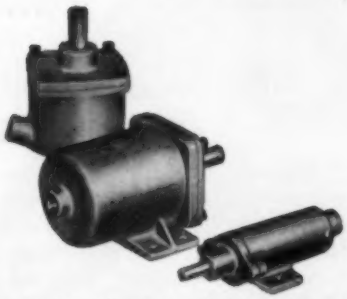
Circle 83 on Reader Service Card

Clamping Problem?



SCHRADER has the answer!



Schrader Air Clamping Cylinders are available either base or leg mounted, in 1", 2¼" and 3" diameters delivering a 2" or 1" stroke. A wide selection of Schrader Valves is available to operate this equipment.

Schrader
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Leaders in air control since 1844

The **Schrader Air Clamping Cylinder** is actually a bantam air cylinder that can *add several minutes* to each worker's production hour . . . eliminate the need for slow, manual clamps.

Think of all the clamping operations in your own shop. Milling machines . . . drill presses . . . power presses . . . welders . . . gluers — and many dozens of other machines that are now idling for ten or fifteen seconds while operators go through slow clamping operations. Why not save time — and operator annoyance — with fast, convenient Schrader Clamping Cylinders, as so many other industrial plants have already done? Remember, you can mount these Schrader Clamping Cylinders anywhere — and actuate them automatically or manually.

For full details on the models available — or any of the hundreds of air control products in the complete Schrader Line — write today. Or, if you prefer, fill out the coupon below.

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Division of Scovill Manufacturing Company, Incorporated
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Company _____

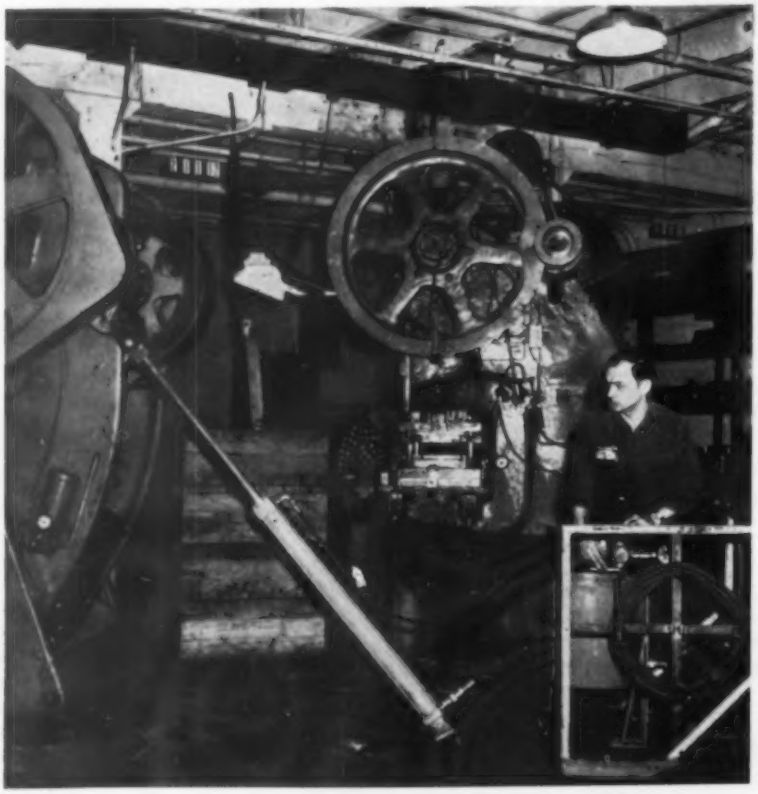
Address _____

BRIEFS about fluid power

HOMEMADE HYDRAULIC LIFTING DEVICE

Two staff engineers at Viking Air Conditioning, a division of The National Radiator Company, designed this portable press lift, which lets one man tilt an open-back inclinable press in a fraction of the time formerly required by three men using an over-head hoist.

The low-cost floor-mounted unit consists of a hydraulic cylinder with a 40 inch stroke, a 2½ inch bore, and a 1¾ inch piston rod. The cylinder is operated by its own portable pump mounted on a cart set on casters. A 3 hp, three-phase electric motor powers the pump, which produces pressures up to 1200 psi, enough to lift more than 2½ tons. Hose connections of the pump and cylinder are of the quick-connect coupler type. Retraction is controlled by a ⅜ inch needle valve.



To receive the cylinder, a permanent bracket is welded to the back of each of the presses, and a floor-mount bracket is sunk into the concrete floor a few feet from the press. The cart containing motor, pump, ten gallon reservoir can be conveniently located by the press, and the cylinder put between the brackets.

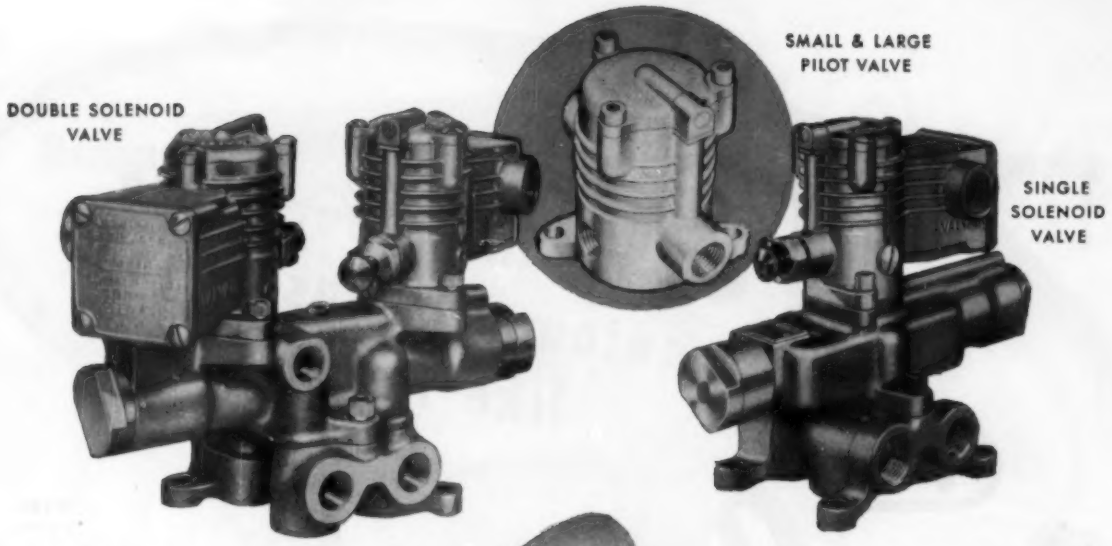
Cost of the entire lift was absorbed in savings in labor and idle machine time in the first two weeks the lift was in service. ▼▼▼

British Industries Fair and Hydraulics

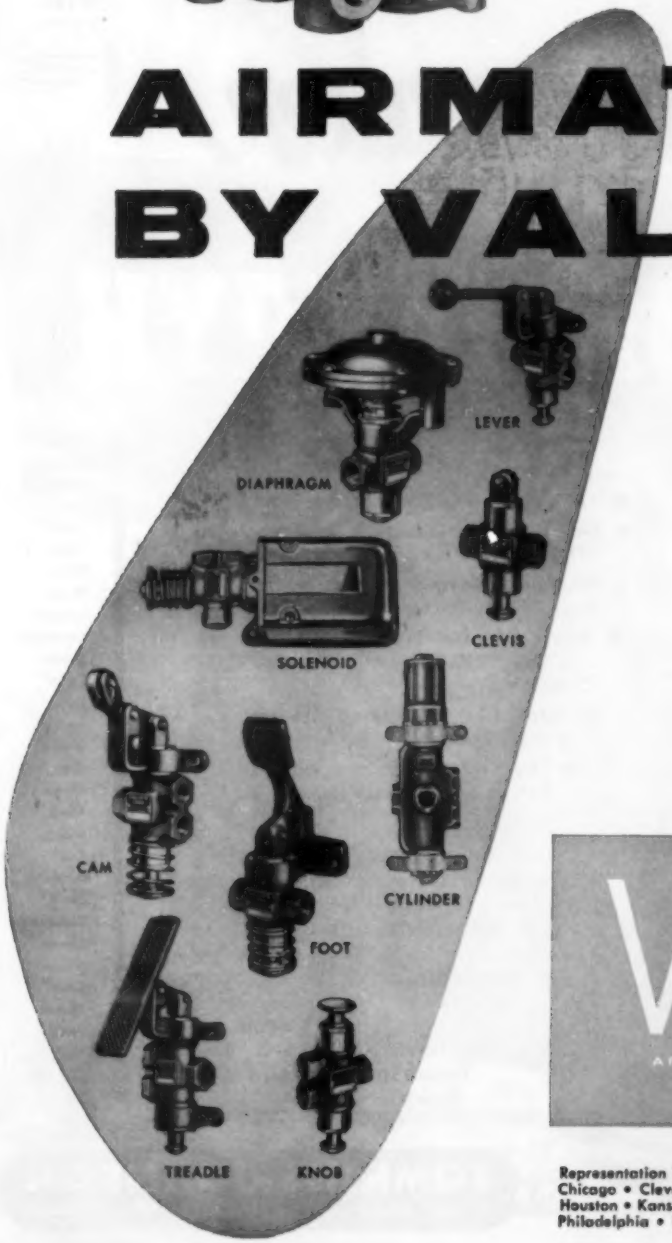
Applications of fluid power are prominently shown at this year's Engineering Section of the British Industries Fair, held in Birmingham, England, at the beginning of this month.

A new exhibit in the material handling field is a 3-ton, fully hydraulically operated, mobile crane manufactured by Lambert Engineering Co. (Glasgow) Ltd. Truck mounted, this crane is claimed to be the lowest priced 3-ton slewing crane on the market. The hydraulic pump, driven from a power-take-off, supplies pressure oil through control valves to three hydraulic motors. These provide power for the main lifting winch,

Continued on page 18



AIRMATION BY VALVAIR



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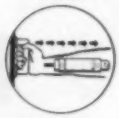

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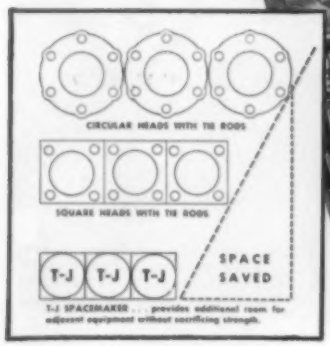
T-J Spacemaker Cylinders get first call for an ever-widening range of power movement jobs in industry today—because they're so advanced in design . . . so efficient and dependable in performance. Wide selection of styles and capacities. Check your needs now! Send for bulletin SM-454-2. The Tomkins-Johnson Co. Jackson, Mich.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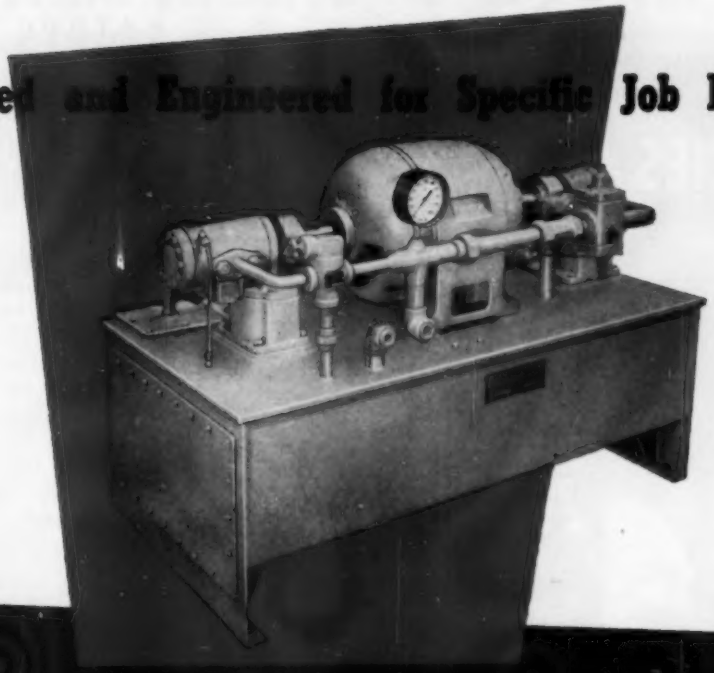

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Available

in popular types and sizes of threads for high or low pressure installation.

Emergencies will happen with even the best hose, but you can greatly minimize the costly down time resulting from hose failure in the hydraulic system. Put idle men and equipment back to work quickly. No special tools—no hose stripping necessary. Anchor Clamp-Type Couplings are easily applied to bulk hose you carry on the job, and may be used over and over again. They insure a firm hold under conditions of impulses and vibrations. Their compact design is an advantage in applications of limited space and a convenience when used with Anchor adapter unions and related fittings. Always have a supply of Anchor Clamp-Type, Reusable Couplings on hand in assorted sizes.

Anchor Clamp-Type, Reusable Couplings are also furnished assembled with hose to satisfy your requirements for heavy duty original-equipment service.

Ask for complete details—send your specifications for recommendations

ANCHOR COUPLING CO. INC.

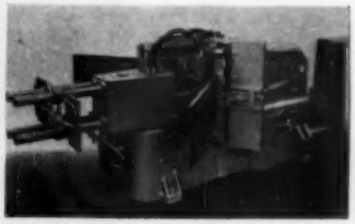
368 North Fourth Street • Libertyville, Illinois

Branch Offices: Dallas, Tex.; Plymouth, Mich.

BRIEFS continued

the hoisting winch and the slewing motion. All three motors are interchangeable for ease of replacement, service and maintenance.

Turner Brothers feature a hydraulically powered tangent bending machine in which the pump-motor assembly is housed in the reservoir at the base of the machine. The 4 hp electric motor



drives the 1600 psi pump which gives a holding pressure of 14,000 pounds. For easy unloading of a finished work piece, the head of the machine is rotated hydraulically into the unloading position, and the work is then expelled by a hydraulic cylinder.

Among pipe bending machinery presented by Lawler Ayres & Co. is a model capable of handling heavy gauge piping up to 3 inches diameter. Powered by a hand operated pump giving pressure of 6000 psi it exerts a bending force of 15 tons. A new attachment permits pipes to be bent up to 180 degrees.

Stationery and portable pneumatic compressors from 3 to 65 cfm are displayed by Alfred Bullows & Sons Ltd. Air motors, reducing valves, filters and fluid regulators are also featured by this company.

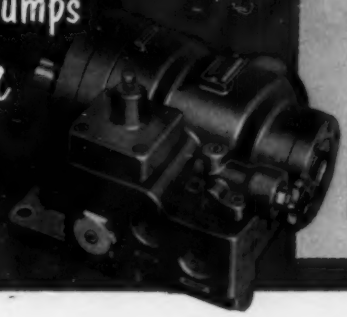
Hydraulic seals and packings are offered by several manufacturers. Hall & Hall Ltd., show their patent fluid seal, developed for sealing shafts which are slightly out of alignment or cylinders which have become worn. Also exhibited are precision rubber components and flexible hoses for various engineering and industrial applications.

Continued on page 20

Do You Want To Save Horsepower and Heat?

VICKERS

Two-Pressure Oil Hydraulic Pumps Require Less Power for Two-Pressure Circuits



Automatically Provide

High Volume @ Low Pressure for fast closing, rapid advance, and rapid return.

•

Low Volume @ High Pressure for feeding, compressing, clamping, and holding.

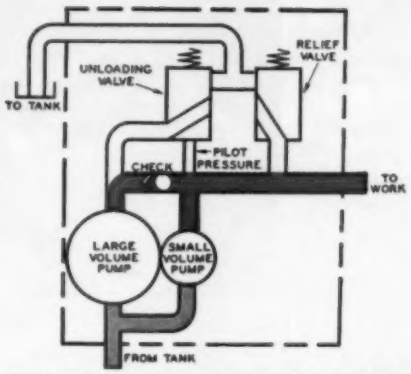


Fig. 1 Combined Delivery of Large and Small Volume Cartridges at Low Pressure

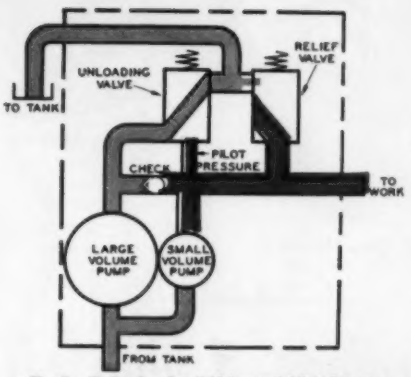


Fig. 2 Delivering Small Volume at High Pressure

Two Vickers Vane Type pumping cartridges are mounted on the same shaft—in the same housing, driven by the same prime mover. One provides a large volume of oil while the other delivers a small volume. These Vickers Two-Pressure Pumps have proved advantageous in a wide variety of applications.

For example, in closing a press or in rapid advance, both pump cartridges work together, supplying maximum volume for quick operation (see Fig. 1). When the press is closed and compression begins, or when the tool goes into feed immediately prior to beginning the cut, the large volume cartridge is automatically unloaded to the reservoir at zero pressure (see Fig. 2). The small volume cartridge alone then provides the lower volume required at high pressure.

These Vickers Two-Pressure Pumps are most economical in power consumption for such two-pressure operation. The reason for this is that a small-volume pump working at full capacity is MORE EFFICIENT than a large-volume pump working at partial capacity. Regardless of momentary delivery, the internal leakage of any pump is proportional to its size and operating pressure. The chart (Fig. 3) shows an interesting comparison between a Vickers Two-Pressure (Two-Volume) Pump and a variable volume vane type pump on a press circuit.

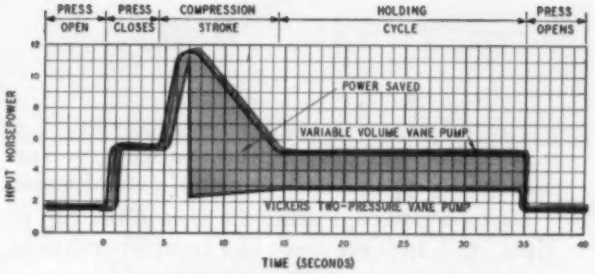


Fig. 3. On this typical press application the saving in power is approximately 50% with a resultant saving in heat in the system.

Like all Vickers Vane Pumps, these two-pressure pumps have the hydraulic balance feature that relieves bearings of all pressure loads (one of the major causes of wear). Cartridge construction enables customer to service in his own plant instead of returning to factory should repairs be necessary. Relief and unloading valves are integral . . . minimizing piping and connections. Complete range of sizes up to 48 gpm. For additional information, ask for Bulletin 54-70a.

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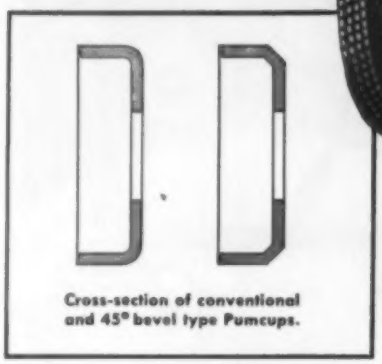
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

2-way gain with Pumcups



Cross-section of conventional and 45° bevel type Pumcups.

Darcova Pumcups are available in various types and textures, in a complete range of sizes, to provide unequalled efficiency and long life in reciprocating pumps, air or hydraulic mechanisms.

★ prolonged high efficiency
★ less maintenance

TODAY hundreds of companies using hydraulic controls, air cylinders or reciprocating pumps are *standardizing* on Darcova Pumcups for piston packing, because they eliminate fluid slippage, costly down-time and maintenance.

Darcova Pumcups make the *most* of the cup packing principle. And, they are made in a complete range of sizes, types and texture-engineered compositions for various pressure-temperature-fluid conditions. Pumcups hold peak efficiency for the life of the cups and outlast other packing as much as 3 to 1.

Why not check these claims right in your own plant? Meanwhile get *all* the facts. Just send for Pumcup Bulletin No. 5503.

DARLING VALVE & MANUFACTURING CO.
Williamsport 15, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP
TRADE MARK
Pumcups

BRIEFS / continued

Rayon Reinforced Hose For Hydraulics

New hose for hydraulic application is being made by combining rubber compounds and strong synthetic yarns such as rayon. This hydraulic hose, permitting pressures up to 250 psi, is used on the suction lines of a power grader

made by the Austin Western Company, Construction Equipment Division, Baldwin-Lima-Hamilton Corp.

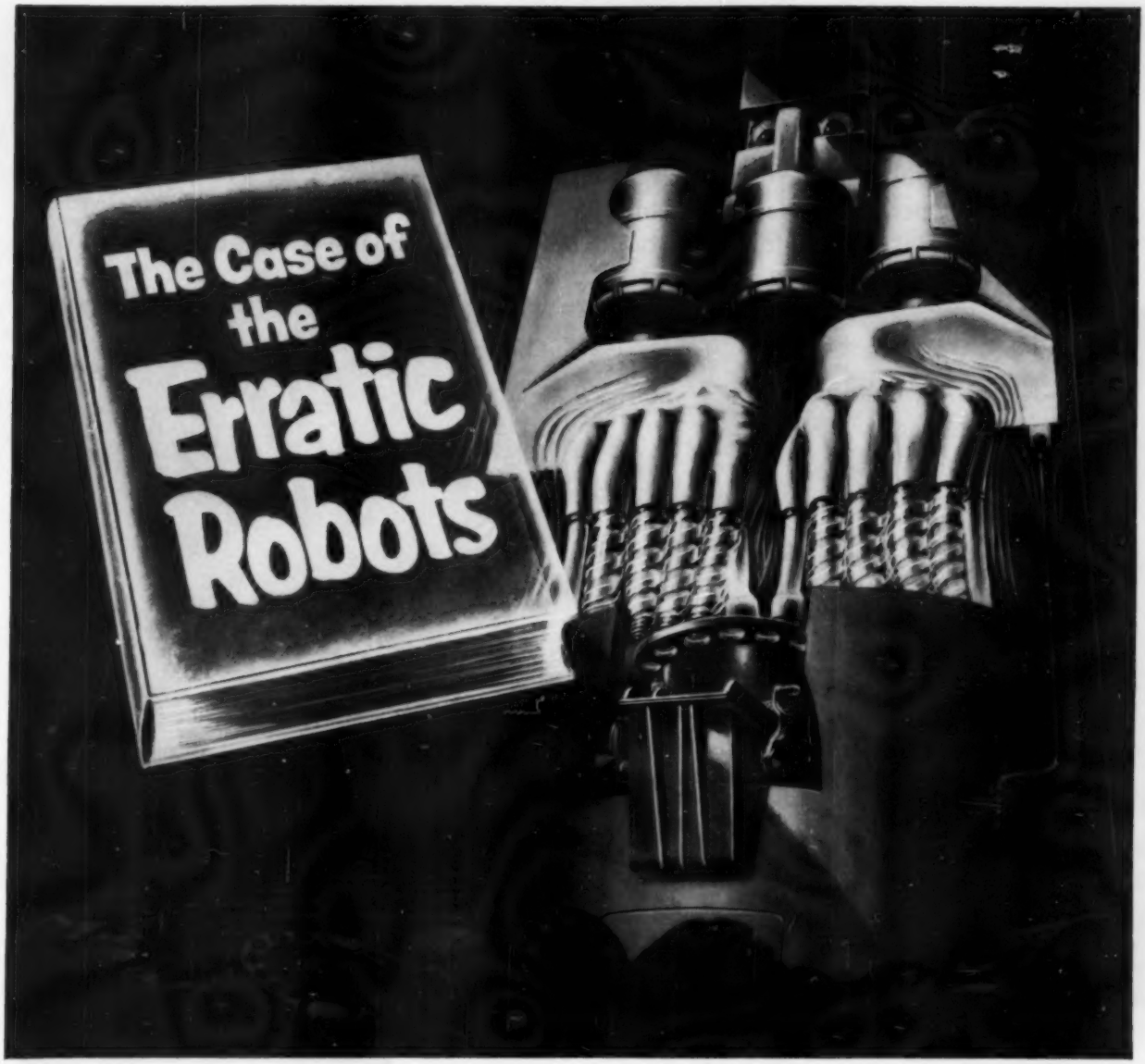
Most of the hydraulic system, which controls the blade, snowplough and other attachments, requires high-pressure hydraulic hose with wire braid reinforcement, but in the suction lines between the pump and the fluid reservoir pressures are lower. ▼▼▼

Fabricating Machinery Hydraulic Conference

D. S. Harder, executive vice president—basic manufacturing divisions of Ford Motor Company, will be the keynote speaker at this year's conference. Sponsored by Vickers Incorporated, the conference will be held May 17 and 18. Attendance is by invitation only.

Directing operations of all basic manufacturing groups, the purchasing office and the office of production programming and control for Ford Motor Company,

Continued on page 24



How Correct Lubrication cured them— saved $7,600

No question about it—these "robots" were *sick!* Temperature of 194°F...."blood pressure" of 800 psi...constant need of transfusions...erratic motion that made them useless for the precision work they were intended to do.

These robots were two hydraulically-operated, automatic machines in a large auto plant. They were used to face and bore flywheel housing assemblies on engine blocks, and were shut down frequently because of hydraulic valve sticking. To overcome this, the operators had doubled oil pressure in the systems. But this, in turn, resulted in excessive oil leakage and high oil temperature that caused fast deterioration of the oil and further valve sticking. Even complete oil changes every two weeks did not eliminate this trouble.

Socony-Vacuum men tackled this problem. Working with plant personnel, they studied the operations. A carefully designed program of lubrication was put into effect. This cure worked. Oil temperature dropped, and the valve sticking ended. Machine operation was smooth. Parts met precision requirements. Savings have already amounted to $7,600!

★ ★ ★

This combination of the right oil plus the world's greatest lubrication engineering service is called—Correct Lubrication. Why not put it to work in *your* plant to help improve production—cut costs?

SOCONY-VACUUM *Correct Lubrication*

FIRST STEP IN CUTTING COSTS

SOCONY-VACUUM OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

The Case of The Bellows Co.
AGAINST
the "two-way" stretch

Tape recorded interview in the plant of [redacted], Minneapolis, Minn.

Operation: Flattening out rolled seams on a panty girdle, using a tool room built machine built around a model BM1-40 Air Motor

Statement of [redacted], plant superintendent.

Q. Mr. [redacted], how did you perform this operation before you had the Bellows Air Motor?

A. When we first started making the garment, we stretched out the seams by hand; it took two girls to stretch for one production unit. Later on, our mechanical branch developed a stretcher. It was operated by foot pressure, but that didn't prove out too good either. Our operators quit on us and they didn't get out as much production as we thought they should. Later on, we got this Bellows Air Motor and hooked it onto the machine. Since then, one girl can do in two hours the operation which formerly took two girls to do.

Q. Two girls to do in how long?

A. It took two girls eight hours a day. It used to take sixteen hours to do what we now do in two hours.

Q. This machine now is handling the stretching and testing for three production lines?

A. That's right. This one machine handles all of the production for three production lines.

The "case of the 'two-way' stretch" is one of many actual production scenes appearing in the motion picture — "OPERATION PUSHBUTTON".

1103A

Q. I imagine that the way you formerly did it was hard on the girls' fingers, wasn't it? Didn't it take a lot of pulling?

A. It took an awful lot of pulling and we had a hard time to keep girls on this operation. They just wouldn't stay, we'd have them for a week or two and we'd have to train new operators. It got so at last they weren't even pulling the seams out the way they should.

Q. Do you think you get a better garment by this method?

A. We get a much better garment, and I feel that it has had a better test, too, because if the seams aren't caught well and sewed well, it is instantly detected as a garment is being stretched.

Q. It's probably a more rigorous test, too, isn't it?

A. Yes. Before, towards the end of the day, the girl we had on the operation would be tired and she would just pull the garment on the form and not stretch it out like it was supposed to be for testing. This way, each garment is tested exactly the same.

Q. Now the customer knows she can be sure of what she is getting?

A. Yes. A garment she buys today and the garment she buys two years hence will be exactly the same because they are all tested the same.

Q. How long has this machine been in operation.

A. This machine has been in operation a little over six months.

Q. Has it given you any trouble?

A. We haven't had a bit of trouble with it.

Q. Would you say it has paid for itself?

A. I feel sure that the machine has paid for itself in the first month.

Q. Do you have a correction, Mr. [redacted] *?*

A. I have a correction. The machine paid for itself in the first week of operation.

The statement you have just read is typical of the hundreds in our files proving the diversity of applications of Bellows Air Motors* in every type of industry.

*The Bellows Air Motor is a uniquely different air cylinder. It is a complete pneumatic power device in itself. Directional valve and dual speed control valves are a built-in part of the unit. Connect it up to an air line with a single length of flexible air hose and it's ready to go. No cumbersome piping to install, no extra valves to buy.

What can it do? It can perform any repetitive push, pull, or lift motion you now do manually, faster, safer, better — with infinitely less fatigue for your workmen, with substantially lower costs for you.

It can be the power heart of countless special purpose machines you can design and build right in your own tool room.

It will give you an entirely new conception of the productive possibilities of "Controlled-Air-Power."

New Motion Picture Portrays Cost Savings Through Use of Pneumatic and Electrical Circuits

●

"OPERATION PUSHBUTTON"

pictures production scenes in almost one hundred plants . . .

●

AVAILABLE FOR SHOWING Without Cost

●

"Operation Pushbutton" is an unusual industrial motion picture. Camera crews traveled over 12,000 miles, visited over one hundred plants, big and little, in the U. S. and Canada to show how industry everywhere uses "Controlled-Air-Power" to lower production costs in an almost unimaginable range of applications. If you have not already seen it, mail the handy coupon below. We will arrange a showing for you without cost or obligation. We guarantee it will be well worth your while.

The Bellows Co.
Dept. AH-555
Akron 9, Ohio

Please have your Field Engineer arrange to show me the motion picture "OPERATION PUSHBUTTON."

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COMPANY_____

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The Bellows Co.
AKRON, OHIO

1103A

NEW "HI-LO" SPEED COUPLERS and CONNECTORS

(HIGH VOLUME — LOW PRESSURE DROP)

"HI-LO" for *highest* air volume, *lowest* pressure drop

Better efficiency, lower operating costs for all air-operated devices.

Easy to use—snap on and off.

Swivel action saves wear on hose.

Wide selection of sizes for greater range of uses.

Leak-proof seal.

Interchangeable with many other brands of couplers and connectors.

Write for bulletin No. 5518T.

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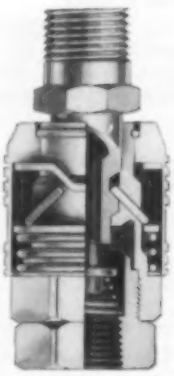
Bryan and Cleveland, Ohio

Aro Equipment of California, Los Angeles, Calif., Aro Equipment of Canada, Ltd., Toronto 15, Ontario.

Offices in All Principal Cities



ARO®
SPEED COUPLERS
Also Air Tools... Air Hoists... Lubricating Equipment . . . Aircraft Products . . . Grease Fittings

BRIEFS continued

Harder has been associated with automotive manufacturing operations since 1912.

Co-moderators for the conference will be Royal E. Russell, master mechanic, Chrysler Corporation and Adolphe J. De Matteo,

D. S. Harder

chief engineer, Watson-Stillman Company Division of H. K. Porter Company, Inc. They will preside at open forum conference sessions which will cover oil-hydraulic systems and system problems for hydraulic press, welding, die casting and plastics molding machines.

▼▼▼

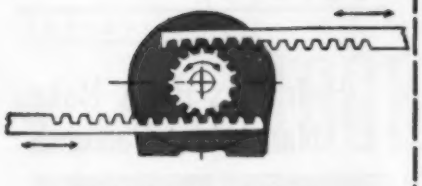
Book On Hydraulic Controls

R. Hadekel has written a very informative book "Hydraulic Systems & Equipment", published by Cambridge University Press, New York. Price $3.75.

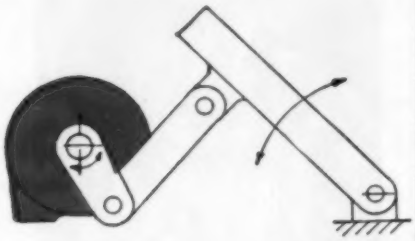
Hadekel discusses fundamental principles of circuits, automatic sequence systems, variable delivery pumps and rotary fluid motors, general design considerations and many other elements of the fluid power field. The well written text with accompanying illustrations will be of assistance to designers, maintenance engineers and all who use hydraulic machinery, though symbols used in the drawings are more familiar to British engineers and will require a little extra study by the American reader.

A bibliography and index complete this 224 pp volume. ▼▼▼

Continued on page 26

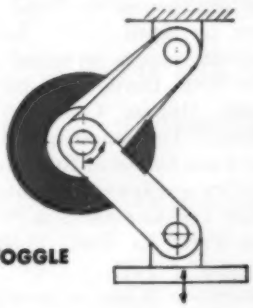


STRAIGHT LINE MOTION
DOUBLE TRAVEL



LIFTING

FIXTURE
POSITIONING
OR
INDEXING



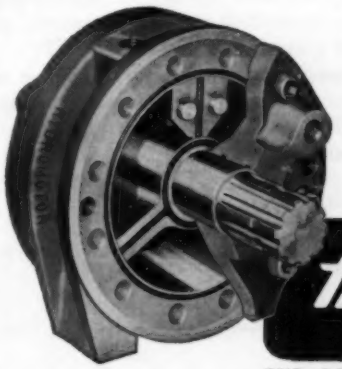
TOGGLE

In AUTOMATION (as in countless other ways) HYDROMOTOR is "On the March"

You can perform all these operations smoothly, positively and efficiently with the Bonnot Hydromotor

Completely sealed and self-contained, the Hydromotor is a simple, dependable, maintenance-free source of *reciprocating rotary power*, installable anywhere . . . at any angle.

Using any hydraulic medium, the Hydromotor develops instant, full torque in either direction through any arc up to 280° . . . may be stopped at any point, reversed, speeded up or slowed down by simple controls. Standard models develop 150 to 300,000 inch pounds torque at 1,000 p.s.i. input. Two vane models, same size, afford double torque values through arcs to 100° —all based on 1,000 p.s.i. oil supply.

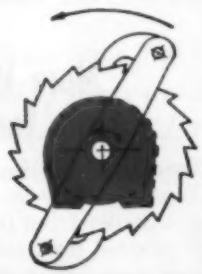


Cleanest Actuator Available—Unsurpassed For Dirt Control

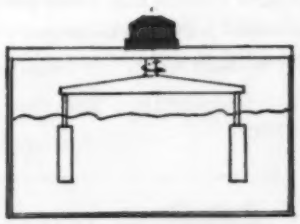
For complete application and engineering data, write for Hydromotor Bulletin 21, *or outline your requirements.*

Hydromotor DIVISION

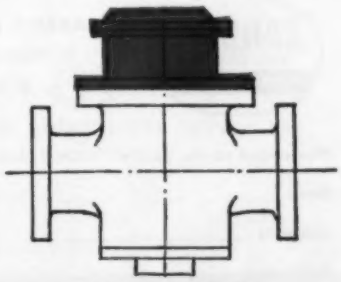
THE BONNOT COMPANY • CANTON 2, OHIO



HIGH TORQUE RATCHET DRIVE



MIXING OR AGITATION
(OSCILLATING ACTION)



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...put SAFETY in your hydraulic lines

...switch to UCON Hydrolubes

Trade-Mark

For maximum fire-resistance, maximum protection for men and machines, change to UCON Hydrolubes—CARBIDE's safety hydraulic fluids. Severe, exhaustive laboratory tests and 7 years' industrial use have proved their resistance to burning.

UCON Hydrolubes are balanced formulations. They contain modern synthetic lubricants and anti-wear agents for lubricity, water for non-flammability, effective liquid and vapor phase corrosion inhibitors for the protection of your equipment, an anti-freeze to keep the pour-point low (below minus 55°F).

You don't have to revamp your equipment to change to UCON Hydrolubes. They have no harmful effects on packings and seals . . . are supplied in a range of viscosity grades . . . have high viscosity indexes (150 to 160) . . . present no toxicity problems.

Remember: **SAFETY** *is no accident . . . return the coupon today.*

UCON Hydrolubes *are products of . . .*

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CARBIDE AND CARBON CHEMICALS COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

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Company_____ Position_____

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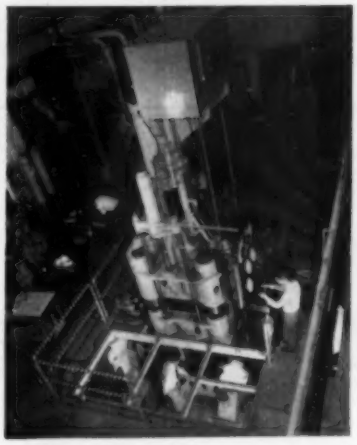
BRIEFS continued

Hydraulics Helps Make Man-Made Diamonds



This huge 1,000-ton press enabled General Electric's Research Laboratory to produce diamonds by subjecting a carbon-containing material to pressures of 1.6 million psi, at temperatures above 5,000 degrees Fahrenheit. ▼▼▼

University Discusses Fluid Mechanics

The Engineering Institutes of the University of Wisconsin held a two day course in Fluid Mechanics on April 12-13. Among the several papers presented was one by R. E. Davis, chief project engineer, Oilgear Company, on "Hydraulic Transmission of Power", and one by David Hutchinson, hydraulics engineer, Sundstrand Machine Tool Company, on "Component Parts for Fluid Powered Equipment".

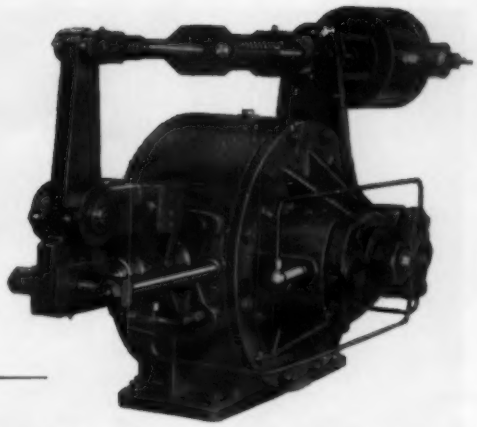
Hutchinson is one of three judges for the 1955 APPLIED HYDRAULICS Prize Paper Contest. ▼▼▼

More Reach From Loaders

For installation on Fordson Major Tractors, Sherman Products, Inc., have developed two new hydraulic powered front end loaders, offering greater reach at maximum and intermediate heights.

Continued on page 30

You are LOOKING at a PUMP



. . . of the highest character in the field of industrial hydraulics for continuous pressures to 3000 p.s.i.

For this reason, we use this pump with our controls as the "heart" of our heavy duty hydraulic systems; it is a measure of the quality of equipment and performance that we can offer you.

Specifically, take a look at what the particular pump and control shown can do:

(1) Variable discharge is provided which can be remotely controlled in an infinite range from zero to maximum for positive speed control of cylinders without dissipating power.

(2) Discharge is also reversible, smooth and shock free, eliminating the need for directional control valves.

(3) No relief valves, either pilot or full pressure, are needed in the hydraulic circuit because the control is of the complete pressure compensating type.

(4) Pressure compensation is provided in both directions of discharge.

(5) Pressure can be infinitely and independently adjusted in both directions of discharge over the full operating range.

Please note that all of the above features are available in a single control, which is one of many available to meet countless job requirements. And this represents just one advantage of LASSMAN systems and equipment . . . there are many more which we would be pleased to discuss with you.

Quality EQUIPMENT for *Quality* PERFORMANCE

BENJAMIN LASSMAN & SON Route 8, GLENSHAW, PA.

PIPE BENDING IN HOLLAND

NO LIMIT

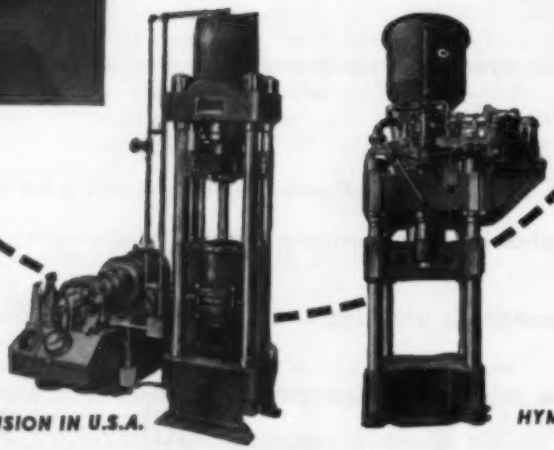
TO THE APPLICATION OF ELECTRAULIC HIGH SPEED PUMPS AND AUTODRAULIC CONTROL VALVES

All over the world, Electraulic high speed pumps and Autodraulic control valves (no solenoids) give consistent performance over a wide range of applications. A direct hydraulic system powered by Electraulic pumps and operated by the Autodraulic push-button control system is an independent unit, unaffected by the demands of other machines, giving any desired pressure at fingertip control—it cannot fail to give increased efficiency and economy in *your* plant.

FORGING IN SWEDEN

IN-LINE PLUNGER PUMP

Electraulic Twin Straight-in-Line Plunger Pump, mounted in a steel bed-plate tank.



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HIGH SPEED PUMPS

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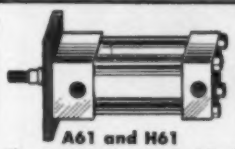
CYLINDERS AND BOOSTERS

"IN STOCK" for immediate delivery...

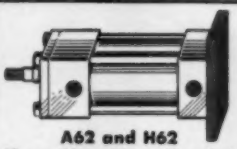
See Miller Bulletins A-105K(Air) and H-104K(Hydraulic) for Complete Dimensions and Engineering Data on these "in-stock" sizes and other Custom Miller Cylinders in bores up to 20" and strokes up to 22 feet.

"IN-STOCK" MODELS

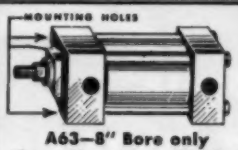
"A" Signifies Miller 200 psi Air Cylinders; "H", 2000 psi Hydraulic Cylinders. Interchangeable Mountings Are Shown In Red On Drawings.



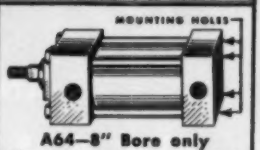
A61 and H61
Flange Mounting on Rod End



A62 and H62
Flange Mounting on Cap End

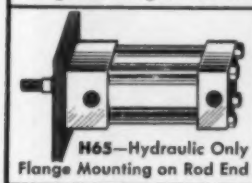


A63—8" Bore only
Flange Mounting on Rod End

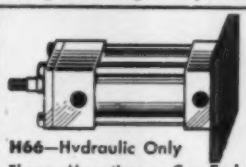


A64—8" Bore only
Flange Mounting on Cap End

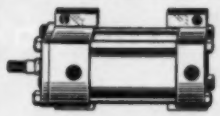
A50 & H50—Tie Rods not extended beyond nuts.
A51 & H51—Tie Rods extended both ends (shown).
A52 & H52—Tie Rods extended. Cap End only.
A53 & H53—Tie Rods Extended. Rod End only.
A54 & H54—Two Tie Rods extended at both ends.



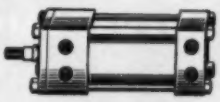
H65—Hydraulic Only
Flange Mounting on Rod End



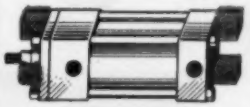
H66—Hydraulic Only
Flange Mounting on Cap End



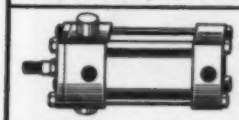
A72 and H72
Side Lug Mounting



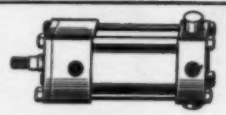
A74 and H74
Side Flush Mounting



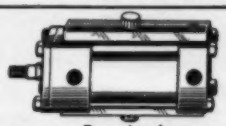
A77 and H77
Side or Foot Mounting



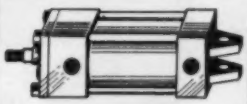
A81 and H81 Trunnion Mounting on Rod End



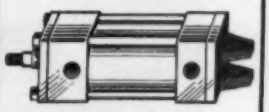
A82 and H82 Trunnion Mounting on Cap End



A83 and H83 Trunnion between Head and Cap (one week delivery)



A84 and H84
Pivot Mounting



A86 and H86
Pivot Mounting

IN STOCK BORES in Inches

"IN-STOCK" STROKES (in Inches)

	Bores	Rod Dia.	Rod Turn Down & Threads		1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
AIR	1½	⅝"	7/16-20	Cushioned																					
				Non-Cush.	1	2	3	4	5	6															
	2	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	2½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	3¼	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	4	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	5	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	6	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	8	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
HYDRAULIC	1½	⅝"	7/16-20	Cushioned																					
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12									
	2	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	2½	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	3¼	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	4	1¾"	1¼-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	5	2"	1½-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36

① "A" and "H" Models 82, 84 and 86 with strokes over 18" require stop tubes.

Column strength requires larger diameter piston rods for the following:

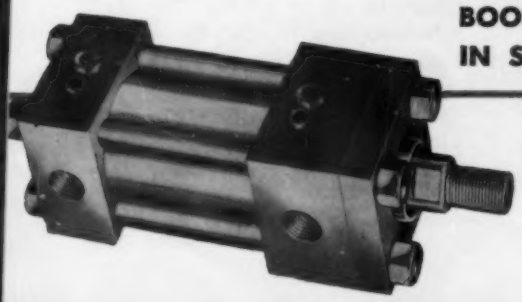
Air Cylinder Models A82, 84, and 86 with strokes inside area (1), when operated at 100 psi and over;

All hydraulic models with strokes inside area (2) and Models H82, 84, and 86 with strokes in area (4), when operated at 2000 psi and over;

④ Models H82, 84 and 86 with strokes inside area (3), when operated at 1000 psi and over.

Depending upon Trunnion Pin location, "A" and "H" Models 83 with standard diameter piston rods can have longer strokes than Models 82, 84 and 86.

See Miller File #251 for oversize piston rod and stop tube requirements.



BOOSTERS IN STOCK

Immediate Delivery on the following Miller 25 to 1 Ratio Boosters (80 psi air input produces 2000 psi hydraulic oil output): Model B4, 5" bore, 1" dia. ram, 6" and 12" strokes; Reciprocating Booster Model DA77-RBA8, 5" bore, 1" dia. ram, 6" stroke. Also Booster Tanks, 5" dia., 6" and 10" heights.

Write For Catalog and Stock Price List

Miller

MILLER FLUID POWER CO.
(Formerly MILLER MOTOR COMPANY)

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AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

ANOTHER

HEAVY DUTY

HYDRAULIC APPLICATION

SOLVED WITH

ROPER PUMPS

Series F Pump . . . for pumping clean liquids of all kinds. Pressures to 300 P.S.I. — sizes 1-300 G.P.M.

SPECIAL HYDRAULIC APPLICATION USING STANDARD ROPER SERIES "F" PUMPS

THE PROBLEM: Develop a centralized hydraulic power unit to operate large elevators and hydraulic pushers through a continuous heat treating and annealing furnace in a steel mill.

THE ANSWER: The enormous hydraulic unit shown; as designed and built by Weinman Pump and Supply Co. of Pittsburgh.

This is but one of many special units developed by Weinman. And, here again, Roper Pumps were selected as integral parts of the complicated power system. Roper Series F Pumps are particularly adaptable to this and other applications because of their four-port design for ease of installation and their unusual *dependability* and *long life.*

You, too, can capitalize on improved performance records by including Ropers as original equipment. Our men in the field will be glad to give you all the assistance you need in the selection of the most suitable size pump for the job.

ROPER *Rotary Pumps*

SEND FOR CATALOG 955

Features the complete Roper line

GEO. D. ROPER CORPORATION

705 Blackhawk Park Ave., Rockford, Illinois

BRIEFS continued

Both models, one with 2000 lb rated lift capacity and 3500 lb breakaway capacity, the other having 2500 lb lift capacity and 4500 lb breakaway capacity, have loading height of 10 foot 10 inches.

Twin double acting cylinders control the bucket tilt and double

acting cylinders provide both lift and down pressure. A crankshaft-mounted gear pump rated at 15 gpm at 1500 psi (21 gpm at 1500 psi for the second model) powers the unit. All piston rods are chrome plated. ▼▼▼

NFPA Marks Second Anniversary

The National Fluid Power Association held their second annual meeting at the Broadmoor Hotel, Colorado Springs, Colorado, on April 4, 5 and 6. Over 80 representatives of member companies and guests attended.

Early arrivals had an opportunity to view a number of training and educational films displayed by the Educational Committee on Sunday, April 3. A number of film and film strip were shown and evaluated in writing. The Board of Directors also held a meeting preliminary to the annual meeting.

Monday was a very busy day. After President Ben N. Ashton's introductory remarks, there were reports by officers and chairmen of Administrative Committees. John Erskine reported on activities of the Board of Directors; E.G. Peterson reported as Association Treasurer; and Barrett Rogers made his

Continued on page 32

On 15 years experience—

KENT OWENS TOLEDO, OHIO

has this to say:

"we specify Snap-Lock Limit Switches and Namco Solenoids on all the standard and special machines we build because of their dependable controls with trouble-free long life"

L. F. Rothert, Director of Engineering
Machine Tool Division

NOTHING determines the efficiency of your production equipment, and the ultimate cost of its product, so much as the often hidden but vital controls that insure its split second precision, and elimination of down-time losses.

That's exactly the function and the guarantee behind Snap-Lock Switches, designed with separate sealed off mechanical sides, and of Namco "Stellite"-Weld Solenoids. Each is a patented product.

Built first to improve controls—"built with machine tool ruggedness"—for our own Acme-Gridley Automatics, these electrical devices are now specified as standard equipment by 90% of this country's machine tool builders alone. Army, Navy and Aircraft suppliers specify them used singly and in combination. Other uses in valves, clutches, switches and innumerable devices, number in thousands.

If you need to step up a cycle of operation—get rid of mechanical wear, save space and insure more dependable, continuous control of your production, ask our Engineers to help you "design one in" to your machine or process. Engineering specification catalogs—Limit Switches EM-51; Solenoid EM-52.

ACME-GRIDLEY
BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing

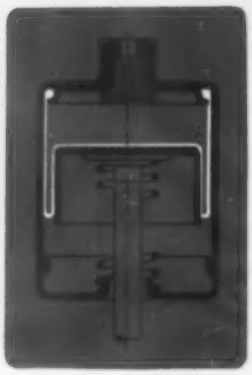
The NATIONAL ACME COMPANY
184 EAST 131st STREET • CLEVELAND 8, OHIO

NEW

flangeless bead-type

Bellofram*

PISTON SEAL



. . . easy to apply

NEW CLASS 1 BELLOFRAM

The new solid head Class 1 Bellofram is a long stroke, deep convolution piston seal diaphragm developed for all pressure sealing applications. With the "O" ring bead-seal characteristic, it will operate efficiently at pressures up to 500 p.s.i. — or up to ten times the rating of ordinary diaphragm seals.

EASE OF APPLICATION SIMPLIFIES YOUR DESIGN PROBLEMS

Actuators using Class 1 Belloframs have longer stroke — are smaller, lighter, much easier to design and manufacture — do not require costly machining or precision alignment. Bellofram's *rolling action* (not sliding) minimizes friction losses. Dynamically stable Belloframs are made of modern fabrics and elastomers for high resistance to fatigue and extreme cycle life. The bead is not subject to operational stress, due to provable wall-friction coefficients and narrow semi-circular convolution of diaphragm under pressure.

FLANGELESS BELLOFRAMS FOR *YOUR* APPLICATION

Put this major improvement in piston seal design to work for you now. Bellofram's unduplicated features include resistance to vibration and chemical action — operation over a wide temperature range — elimination of leakage — control of effective area to within 0.1% over complete working stroke. No lubrication needed — no maintenance except simple, infrequent replacement — accurate, economical operation where ordinary seals fail. Outline your application and submit a sketch to find out how a standard or custom-engineered Class 1 Bellofram can solve your pressure application problems. Your data considered confidential. Write today.

*Trade Mark

Bellofram
CORPORATION
140 MOODY ST., WALTHAM, MASS.

BRIEFS / continued

report as Executive Secretary. E. E. Yaggy, Jr., Membership Committee Chairman, reported 14 new association memberships and a net gain of 8 companies since the fall meeting. John J. Pippinger, Rules Committee Chairman, reported a change in the by-laws to require that prospective member companies be in the field at least two years. J.A. Marsh reported both as chairman of the Nominating Committee and as chairman of the Insignia Committee.

Speaker on the morning program was L.H. (Lou) Schuette, Vice President of the Sundstrand Machine Tool Co. and NFPA Director, who introduced the keynote of the two day meeting with his paper, "Markets for the Fluid Power Industry". Mr. Schuette listed nine markets as major outlets: agricultural, aircraft, material handling, mining, ordnance, petroleum processing, power and utility, railway equipment and productive machinery. He pointed out that these markets are still great potentials for much more fluid power components and systems. A symposium on "Markets" was presided over by W. R. Lockridge, Chairman of the recently formed Markets and Marketing Committee.

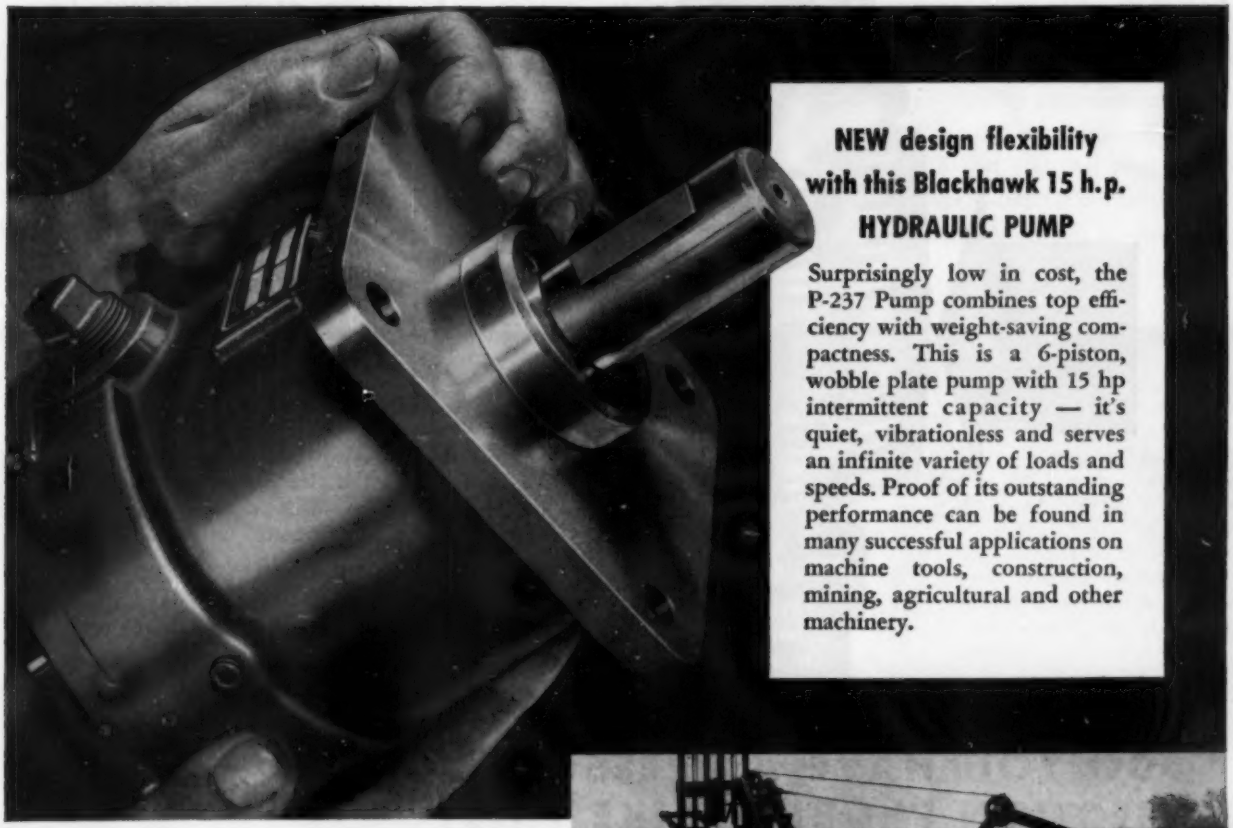
Four major fields were represented by the speakers: Agriculture by Wayne H. Worthington, Director of Engineering Research, John Deere Waterloo Tractor Works; Aircraft by Wendell Eldred, Engineering Manager, Bendix Aviation Corporation, South Bend, Ind.; Marine by P.H. Girouard, Chief Engineer, BuOrd; and Production Machinery by G. F. Nordenholt, Editor, Product Engineering.

Operating Committees

O. Wendell Macy acted as chairman of the Tuesday morning session which was given over to a BDSA (Business Defense Service Administration) talk, a look at the new basic Association brochure and to reports of the Operating Committees. Stan D. Kroe-

Continued on page 34

UP TO 93% OVERALL OPERATING EFFICIENCY - - - - *YET LOW IN COST!*



NEW design flexibility with this Blackhawk 15 h.p. HYDRAULIC PUMP

Surprisingly low in cost, the P-237 Pump combines top efficiency with weight-saving compactness. This is a 6-piston, wobble plate pump with 15 hp intermittent capacity — it's quiet, vibrationless and serves an infinite variety of loads and speeds. Proof of its outstanding performance can be found in many successful applications on machine tools, construction, mining, agricultural and other machinery.

OUR BUSINESS IS *HYDRAULICS* ...*to help power your business*

For positive, long-life, low-cost controls, you can't beat Blackhawk Hydraulics whether they are pumps, cylinders or valves . . . a single component or a complete system. Get the facts now. Write for detailed engineering literature on Blackhawk hydraulic components for original equipment.

A Blackhawk hydraulic control expert will be glad to analyze your requirements.

See Sweet's Product Designer's File

LEADING MANUFACTURERS CHOOSE BLACKHAWK

The P-237 Pump is used in the famous "Hydro-Hoe" pictured here. Blackhawk design helps hundreds of manufacturers save materials, reduce assembly time, create new sales appeals and build customer satisfaction.

PIONEER SPECIALISTS IN HYDRAULICS FOR *27* YEARS

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DO YOU HAVE A PRESSURE INJECTION PROBLEM LIKE THIS?

This is Sealol's own pressurized drilling attachment which is an adaptation of a Sealol Fluid Transfer. It delivers coolant at high pressure for high speed deep hole drilling. Sealol Fluid Transfers are easily adaptable to power-operated machine tools, steam heated drying rolls, refrigerated chilling rolls, hydraulically actuated clutches, and many other pneumatically and hydraulically controlled mechanisms.

Sealol will be glad to work with you on your fluid transfer problems. Send for Bulletin NL-155 describing the Sealol Drilling Attachment, or ask for engineered recommendations on any transfer problem, whether high or low pressure.

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SEALOL

THE BALANCED PRESSURE SEAL

BRIEFS continued

ger, general manager of the Pacific Telephone Co., Seattle, now on loan to the BDSA spoke on "The Partnership of Industry and Government" in which he emphasized the cooperative attitude of government toward industry. Jim Mohrhauser, Works Manager, Racine Hydraulics & Machinery, Inc., outlined and showed on the screen the new 16 page general brochure about hydraulic applications in industry which will be ready for distribution very shortly. More than 100,000 copies were subscribed for at the meeting. This work was done as a sub-committee of the Educational Committee. ▼▼▼

Meetings In The Fluid Power Field

May 16-20: 6th National Material Handling Exposition will take place at the International Amphitheatre, Chicago.

June 16-18: The British Institution of Production Engineers will hold a three day conference, in Margate, England, on the subject of "The Automatic Factory—What Does It Mean?". Besides technical aspects of automation, consideration will also be given to economic, sociological, handling and safety problems.

September 12-16: "Instrumentation Paces Automation" is the theme of the 10th Annual Instrument Conference and Exhibit of the Instrument Society of America, scheduled for the Shrine Exposition Hall and Auditorium, Los Angeles. In conjunction with this conference will also be an Analytical Instruments Clinic.

October 24-28: The Canadian Tool & Equipment Show, to be held at the Show Mart, Montreal, Canada.

October 27-28: The Eleventh National Conference on Industrial Hydraulics will be held at the La Salle Hotel, Chicago. For reservations write to C. A. Arents, Secretary, Illinois Institute of Technology, Technology Center, Chicago 16. ▼▼▼

Circle 125 on Reader Service Card

Circle 132 on Reader Service Card →

Fiatt, Illinois Mine uses STANOIL *Industrial Oil in stripper hydraulic jacks for 18 years*

At Truax-Traer Coal Company's Fiatt, Illinois, mine, the production goal is 1,000 tons of coal an hour. That's a stiff assignment. It leaves no margin for failure. This indeed applies to the hydraulic jacks of the company's Bucyrus-Erie 950-B stripper. It's the reason STANOIL Industrial Oil has been used as the hydraulic fluid in the four hydraulic jacks since the stripper went into operation in 1937. Eighteen years continuous service is testimony to STANOIL's ability to deliver under any operating condition—heat, cold, rain, dust, dirt.

But there's more to the story than just the ability of STANOIL Industrial Oil to deliver under a wide range of operating conditions. The rest of the story is the Standard technical service provided by men with training and experience.

This combination — (1) top quality products (2) technical service provided by experienced men — is ready to serve you. Want this combination to go to work for you? In the midwest just call your nearby Standard Oil lubrication specialist. Or contact: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Since start of operations in 1937, STANOIL Industrial Oil has been used as hydraulic fluid in Bucyrus-Erie stripper at Truax-Traer Coal Company mine, Fiatt, Illinois. This 950-B stripper is hub of one of the biggest strip mining operations in Fulton County, state's second largest coal producing county.

Bob Wright, Standard Oil lubrication specialist is on the spot to provide technical service on lubrication problems. Bob has a B.S. in engineering from Michigan College of Mining. Before entering field sales work, Bob completed Standard's Sales Engineering School course in industrial lubrication. Customers find this experience and background pay off for them.

STANDARD

STANDARD OIL COMPANY

(Indiana)

new!

ALDRICH

air-driven HYDRAULIC PUMP

. . . *for small volume capacity at low or high pressures*

Here is a new pump that will develop up to 30,000 psi from ordinary 90 psi plant air—without auxiliary equipment! This air-driven hydraulic pump is self-contained, complete with regulator, air filter, lubricator and pressure gauge.

New design provides economy of operation for many industrial applications—

- *supplying power for molding and belt presses*
- *testing tubing, valves or pressure vessels*
- *ideal for laboratory as well as production use*
- *and for many other applications requiring small volume capacity at low or high pressures.*

Special muffler design provides quiet operation.

Aldrich Air-Driven Hydraulic Pumps are available in low and high pressure models, single or double-acting. Plunger diameters for the low pressure range are 1¼″ to 3″. High pressure range, ½″ to 1⅛″. Double-acting units provide minimum pressure fluctuations in addition to greater volumes.

Write for new Data Sheet 36 for complete details.

the ALDRICH *pump company*

. . . Originators of the Direct Flow Pump

14 GORDON STREET • ALLENTOWN, PENNSYLVANIA

Representatives: Birmingham • Bradford, Pa. • Boston • Buffalo • Carmi, Illinois • Charleston, W. Va. • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Duluth Houston • Los Angeles • New York • Oakland, Calif. • Philadelphia • Pittsburgh • Portland, Ore. • Richmond, Va. • Rochester • Salt Lake City • San Francisco • Seattle Somerville, Mass. • Spokane, Wash. • Syracuse • Tulsa • Washington, D. C. • Youngstown • Export: Petroleum Machinery Corp., 30 Rockefeller Plaza, New York 20, N. Y.

'VSG' HYDRAULIC VALVES
Regd. Trade Mark
'VSG'
THROTTLE VALVES
DIRECTIONAL CONTROL VALVES — HAND OPERATED
VICKERS-ARMSTRONGS LIMITED
A copy of this new Catalogue containing technical diagrams and data of 'VSG' Hydraulic Valves will be sent on request to all interested. Please ask for Publication 1763.

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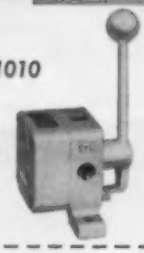
Ledeen

PNEUMATIC AND HYDRAULIC EQUIPMENT

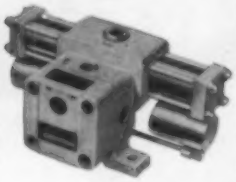
VALVES
bulletin 1010



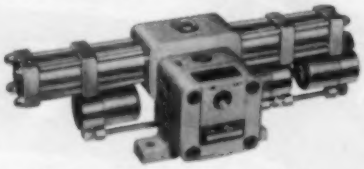
Hand Valves
Manual or spring return to neutral or to reverse.

Foot Valves
Single pedal spring return to reverse.

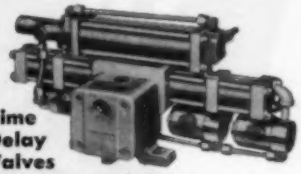
Foot Valves
Double pedal foot or spring return to neutral.



Power Valves
Two position, forward and reverse.

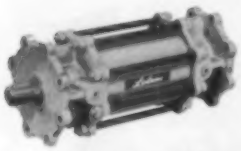


Power Valves Three position, forward, neutral and reverse.

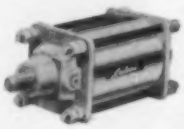


Time Delay Valves
Power operated closing after delay interval.

CYLINDERS
bulletin 500



Heavy Duty Cylinders



Medium Duty Cylinders

Boosters

Special Cylinders

VALVE ACTUATORS
bulletin 3030

Gate Valve Actuators

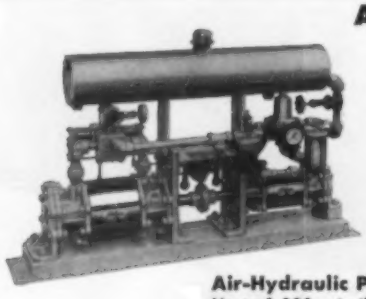
Diaphragm Valve Actuators

bulletin 3020

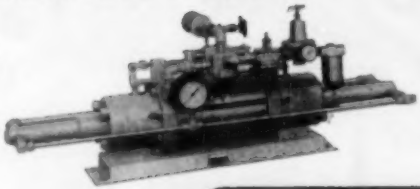
Plug Valve Actuators

Plug Valve Actuators

AIR HYDRAULIC PUMPS *bulletin 4000*



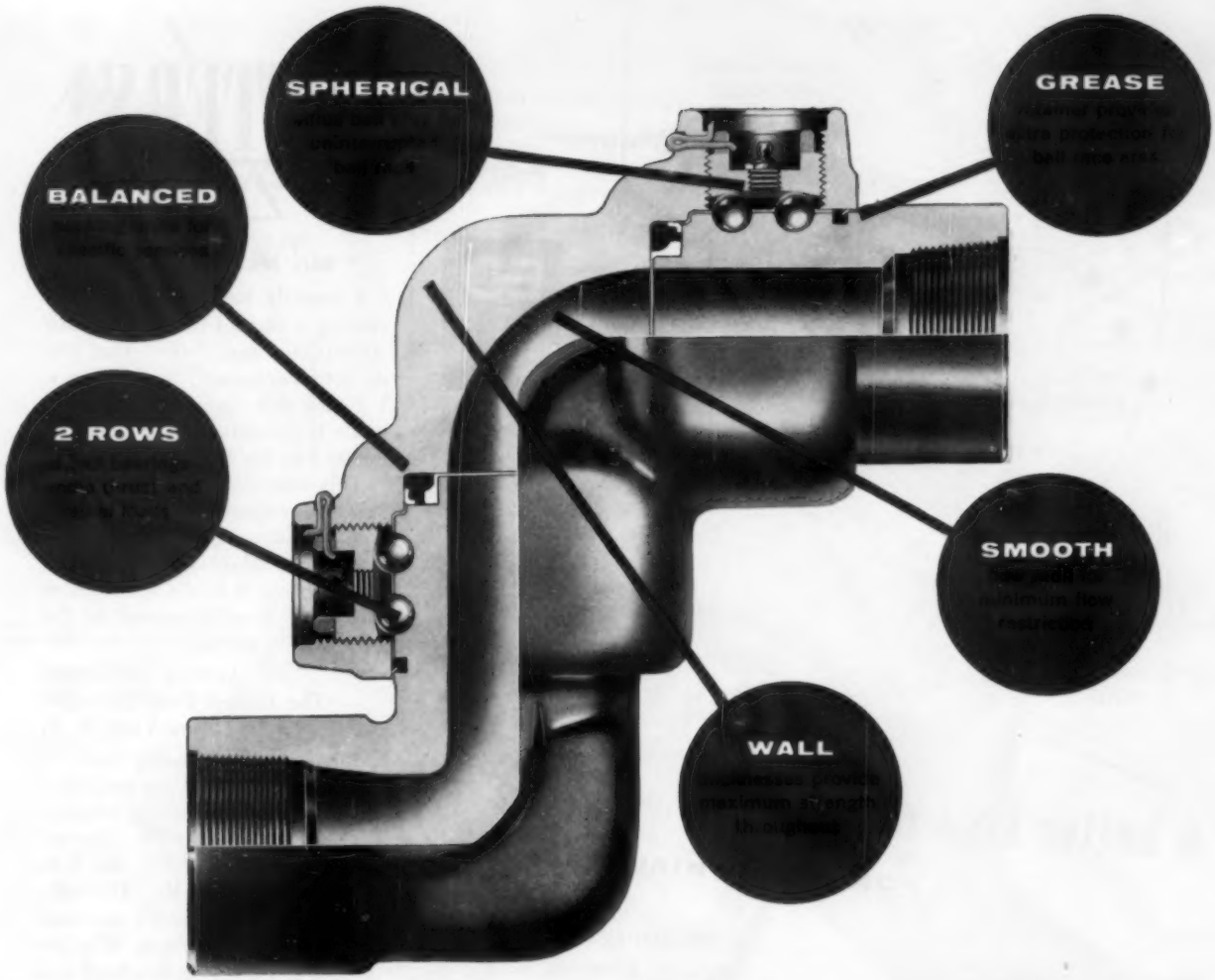
Air-Hydraulic Pumps
Up to 1,000 psi oil from 100 psi air or gas.



Air-Hydraulic Pumps
Up to 10,000 psi oil from 100 psi air or gas.

Ledeen Mfg. Co.
1610 So. San Pedro St.
Los Angeles 15, Cal.

Top quality—prompt delivery



precision engineered for your service

CHIKSAN Ball-Bearing Swivel Joints are precision engineered like a fine watch to give unlimited flexibility and unlimited service in the conduct of fluids, gases and liquids.

CHIKSAN is the originator and largest exclusive manufacturer of ball-bearing swivel joints in the world today.

CHIKSAN produces packing designs for specific service requirements, assuring constant torque at any given pressure.

CHIKSAN has acquired a world-wide recognition for highest quality of product and lowest maintenance costs.

CHIKSAN has over a quarter of a century of "know-how" in the design, manufacture and successful scientific application of ball-bearing swivel joints in industry.

CHIKSAN offers the widest range of styles, sizes and pressures available for every major industrial use today.

CHIKSAN has complete nation-wide coverage of its products and applications by qualified field service engineers.

CHIKSAN will custom engineer for you the solution to any problems involving the transport of fluids, gases and liquids.

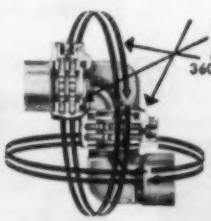
Write CHIKSAN for latest INDUSTRIAL CATALOG—G-4 Dept. AH-5

Supply and Service of CHIKSAN Ball-Bearing Swivel Joints is always as near as your telephone.

The Flow of Enterprise Relies on

CHIKSAN

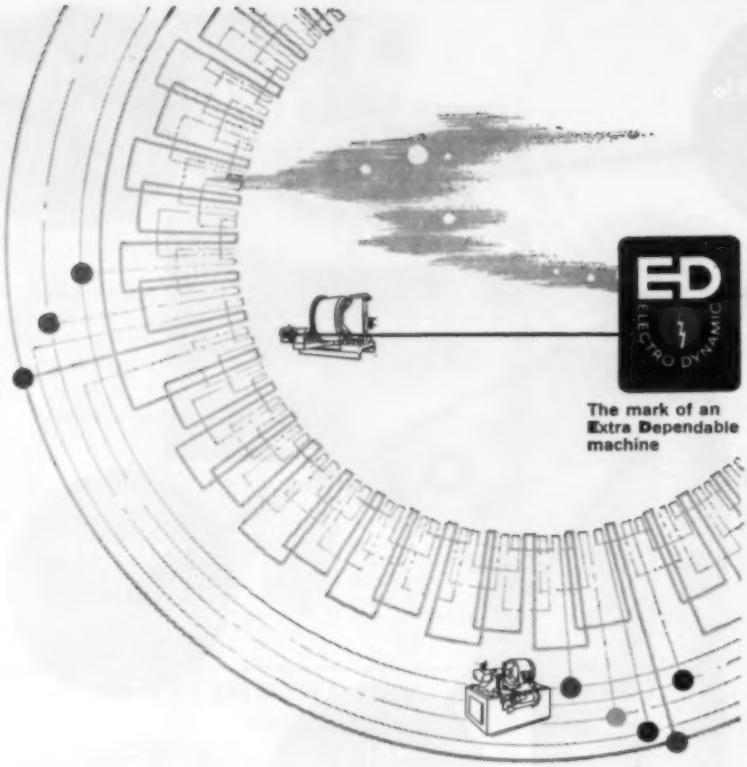
Ball-Bearing Swivel Joints



CHIKSAN Ball Bearing Swivel Joints are THE NEW TOOL of Modern Industry with full 360° rotation in 1, 2, and 3 planes. Over 1,000 different types, styles, and sizes have been developed for pressures and services from 28" vacuum to 15,000 psi and for temperature ranges from minus 70° to a plus 500° F. with packing materials for each specific service.

CHIKSAN COMPANY • BREA, CALIFORNIA • Chicago 3, Illinois • Newark 2, New Jersey

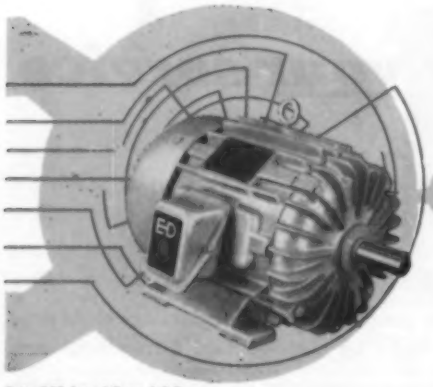
Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Subsidiaries: Chiksan Export Co., Brea, Calif.; Newark 2, N. J. • Chiksan of Canada Ltd., Edmonton, Alta.



The mark of an Extra Dependable machine

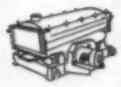
a better kind of power

FOR INDUSTRIAL MACHINES



1 to 250 hp. AC and DC. N.E.M.A. standards.

Extra starting and anti-stalling capacity: Extra cool, extra quiet operation: Achieved without sacrifice of full-load efficiency. Backed by unparalleled experience, E.D. motors are *extra dependable*—75 years in the making—yours today *at no extra cost!*



ELECTRO Extra DYNAMIC Dependable motors

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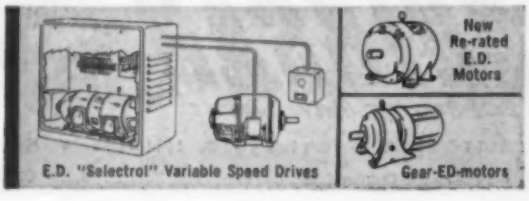
PRODUCT OF GENERAL DYNAMICS

NEW...

Write for Brochure 100 and literature on new E.D. motors and drives.

Electro Dynamic division of General Dynamics Corporation Bayonne, New Jersey



LETTERS to the editor

Mr. McNeill's Book

I recently had the pleasure of reading a current issue of APPLIED HYDRAULICS and noticed that you do not seem to carry book reviews. I found this disappointing since yours is the only U. S. publication devoted to the field of hydraulics.

This company will shortly publish an excellent book by Ian McNeill, *Hydraulic Operation and Control of Machines*. We would like to bring it to the attention of the professional personnel in the field of hydraulics.

ARTHUR G. CHILDE
The Roland Press Company
New York, N. Y.

Reviews of outstanding books in the fluid power field are published in the "Briefs" columns of APPLIED HYDRAULICS *magazine. Several months ago, Mr. Childe, the British publishers of Mr. McNeill's book sent us a copy. We reviewed it in the March issue. We are pleased to learn that this book will be published in the United States. Many readers have asked us for the name of the publisher.*

Editor's Note:

The Roland Press Company, 15 East 26th Street, New York, N.Y. expects to have this publication ready this month. Price $7.50.

Training Course in the East

In answer to Mr. Bernard Kleban's letter, printed in the March issue, which asks for a training course in the East, you will recall we had the same problem here and were unable to find a complete course anywhere. Allan Steel and I have worked out and taught two sessions of a course. In presenting this course we have had made up a series of colored slides showing the operation of the various hydraulic components. At the end of the course we have asked the students to develop representative cir-

Continued on page 42

New...

for machine designers and users...

J-M brings you a

COMPLETE OIL SEAL REFERENCE MANUAL

Here, in one handy book, is everything you need to know about America's leading oil seals. In 28 pages, fully illustrated, J-M tells you how you can improve performance and cut costs with more effective sealing, longer lasting Clipper Seals.

There are detailed descriptions of all the latest standard seal designs including the new LPD and RPD . . . as well as those for special applications. Uses in petroleum, automotive, mining, earth-moving, aviation, iron and steel, machine tool and process industries are covered thoroughly.

Documented case histories tell how leading manufacturers have profited from the superior performance of Clipper Seals. Full use is made of every type of illustration for complete descriptions of important applications. Close-up photographs show how to install split Clipper Seals in limited space.

Learn how Clipper Seals' many advantages can cut costs for you . . . by simplifying design problems, speeding assembly and providing improved lubricant retention and dirt exclusion under all conditions. Write for free brochure PK-71A to Johns-Manville, Box 60, New York 16, N. Y. In Canada, Port Credit, Ont.

JM PRODUCTS

Johns-Manville CLIPPER SEALS

Johns-Manville, Box 60, New York 16, N. Y.
Please send me free copy of new Clipper Oil Seal Brochure (PK-71A)

Name_____ Title_____

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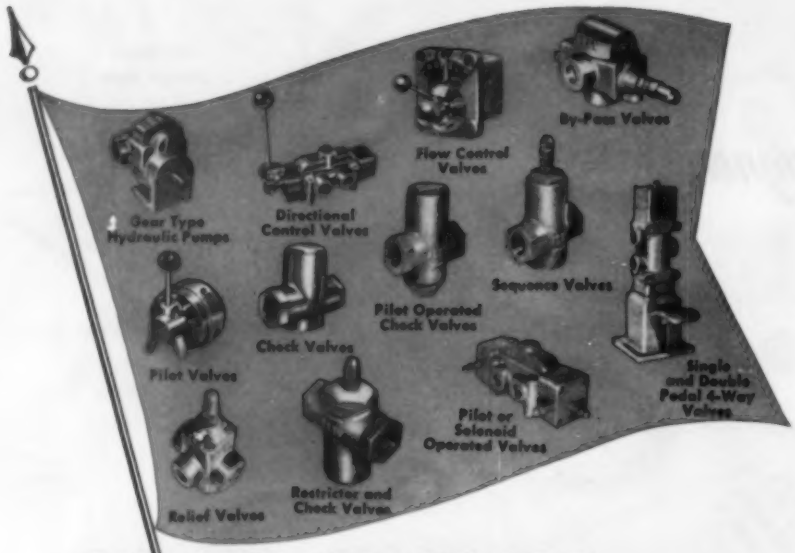
Address_____

City_____ Zone_____ State_____



BY ANY STANDARD...

ADEL *Refinements* assure Plus Performance for Your Equipment

Designers and Engineers have set these standards for Industrial Hydraulic Equipment

Rugged simplicity • Long life • Simplification of piping • Reduced installation costs • Greater accessibility for maintenance • Completeness of line • Over-all economy

ADEL brings them all to you!

Smooth economical hydraulic power for Pushing, Pulling, Lifting, Pressing, Clamping and Controlling.

Illustrated are but a few of a wide variety of ADEL industrial hydraulic control equipment that offer definite benefits to both the user and builder of machine tools and many other kinds of equipment. ADEL products incorporate proven design and precision construction features that assure dependable operating efficiency over the years. A complete line for every application. You can simplify your Hydraulic Power Motion Problems by specifying ADEL.

For complete engineering specifications and counsel, Address: ADEL PRECISION PRODUCTS, A Division of General Metals Corporation, 10771 Van Owen Street, Burbank, California

ADEL
PRECISION PRODUCTS
A DIVISION OF GENERAL METALS CORPORATION

Manufacturers of Industrial Hydraulic Control Equipment

DISTRIBUTORS: AIR-DRAULIC EQUIPMENT CO., HOUSTON, TEX. • AIR & HYDRAULIC ENGINEERING CO., NEW HAVEN, CONN. • RUSS CHAMBERLIN COMPANY, PORTLAND 14, ORE. J. BOYD COATES, GLENSIDE, PA. • CORBY SUPPLY COMPANY, ST. LOUIS, MO. • FRANK T. DONNELLY COMPANY, PITTSBURGH 38, PA. • HASKEL ENGINEERING & SUPPLY CO., GLENDALE 4, CALIF. • HASKEL ENGINEERING & SUPPLY CO., SAN FRANCISCO 7, CALIF. • AIR-DRAULICS COMPANY, PHOENIX, ARIZ. • INDUSTRIAL AIR & HYDRAULIC EQUIP. CO., DETROIT 15, MICH. LINCOLN SUPPLY COMPANY, PROVIDENCE, R. I. • L. H. MONSEES, INDEPENDENCE, MO. • THE NEFF ENGINEERING CO., FORT WAYNE 3, IND. • POWER DRIVES, INCORPORATED, BUFFALO, N. Y. • SCOTT EQUIPMENT & ENGINEERING CO., DAYTON 10, OHIO • ROBERT TAYLOR & SONS, SALT LAKE CITY 10, UTAH • WYATT SALES COMPANY, CLEVELAND 15, OHIO TRI-STATE SUPPLY COMPANY, BROOKLYN 33, N. Y.

LETTERS to the editor

cuit problems. Perhaps Mr. Kleban would like to contact us and if there is enough general interest we might arrange to work out an outside course.

C. B. BLAKE
Scovill Manufacturing Company
Waterbury, Connecticut

We are glad to learn that you have made progress on your course. There is certainly a need for a practical course in your area. Courses are being taught in the evening division at Fenn College in Cleveland. They are well received. More than 90 men are enrolled this semester. That should be incentive enough for any school in your area to add a course in Industrial Hydraulics to their curriculum.

Low Friction

We are interested in obtaining complete details in connection with an article entitled "Low Friction Treatment for Rubber Parts" which appears on page 22 of your March 1955 issue.

We would appreciate it if you would supply us with the name and address of a distributor in this area.

J. R. CLARK, JR.
James-Pond-Clark
Pasadena, Calif.

We have forwarded your request for more information to the manufacturer of this material.

More About Books

Please send me a copy of your APPLIED HYDRAULICS Data List. Also, I would appreciate learning where I can get the JIC air and oil circuit drawing kit mentioned on page 65 of the March AH magazine.

You mention a new book, Ian McNeill's. This sounds interesting. Can you give us definite information as to the price and where to send for a copy?

I might also add that I am certainly well satisfied with Elmer

Continued on page 44

DENISON *MULTIPUMP*

VARIABLE VOLUME VANE PUMP

DENISON MULTIPUMP gives you variable volume at constant speed plus constant volume at variable speed

NEW, EXCLUSIVE MULTIPUMP PRINCIPLE makes possible great savings in horsepower . . . by delivering only the oil needed by the circuit.

SIMPLE, UNIVERSAL CONTROL—in one compact unit—combines features available in other pumps only as optional items . . . and, in most cases, MULTIPUMP eliminates circuit components usually needed in addition to the pump itself.

FINGER-TIP CONTROL. Simple hand dial adjusts volume. Volume is maintained by MULTIPUMP regardless of variations in pressure and pump speed.

and in addition . . .

PRESSURE COMPENSATED, easily adjusted. Can be remotely controlled. Can be vented.

OPERATES COOLER. New Denison design principle circulates oil from tank at all discharge rates, even when pump is compensated.

SEND FOR FACTS. Operating characteristics, sizes and capacities of Denison MULTIPUMP are given in Bulletin 190. Write

DENISON Hydr OIL ics

HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

THE DENISON ENGINEERING COMPANY
1166 Dublin Road • Columbus 16, Ohio

NEW NP Power Drive Cylinder

. . . has all the "most wanted" design features

No other cylinder offers you so many vital features: compact, streamlined design; lightweight aluminum alloy and steel construction exceeds all strength requirements; interchangeable mountings — foot, flange, pivot, clevis and trunnion. Every cylinder can *operate with air, water or oil without interchanging or adding parts:* Adjustable cushioning (optional) can be added to any cylinder at any time.

PLUS

1. Sealed-in lubrication eliminates line lubricators.
2. Rod wiper and long, self-lubricating bronze rod bearing.
3. Self-compensating synthetic multiple "V" rod packing.
4. Rod packing and bearing externally removable.
5. Large porting gives quick response and smooth performance.
6. Rotatable end caps allow 360° piping location.
7. Rust-proofed cylinder tubing has tough I.D. surface.
8. Bronze piston bearing assures maximum support.
9. Ground and polished stainless steel piston rod.
10. Synthetic "U" cups automatically adjust for wear.

Mail this coupon for data sheets

INDUSTRIAL ACTUATORS AND CONTROLS DIVISION,
NATIONAL PNEUMATIC CO., INC.
125 Amory Street, Boston 19, Mass.

GENTLEMEN: Please send me complete information on

☐ NP Power Drive Cylinder ☐ NP Power Check feed control
☐ NP Power Trol valves

*Name*_____ *Title*_____

*Company*_____

*Street*_____

*City*_____ *Zone*____ *State*_____

NATIONAL PNEUMATIC CO., INC. AND **HOLTZER-CABOT** DIVISIONS

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Sales Service Representatives in Principal Cities throughout the World

Designers and manufacturers of mechanical, pneumatic, hydraulic, electric and electronic equipment and systems

LETTERS to the editor

Heiser's book *Air and Oil Cylinders for Industrial Applications.* The beginner in this field should not miss this valuable text.

WILLIAM R. REUTER, JR.
Oconomowoc, Wisconsin

Thank you, Mr. Reuter, for your nice comment about Mr. Heiser's book. We think so too. We have sent you the Data List which is a bibliography of available literature in the field and is free to readers requesting a copy. Information on the circuit drawing kit and the book has also been sent.

Film List

APPLIED HYDRAULICS *has prepared a list of films covering pneumatics and hydraulics. This list briefly describes 48 available films and tells where each film may be loaned, rented or purchased. This film list will be sent free to readers requesting copies.*

Hydraulic Fluids

In your reports of SAE aircraft meetings contained in the December 1954 issue of APPLIED HYDRAULICS, you mention the MLO 8200 fluid for high temperature use. Would you put us in touch with the manufacturer?

ROBERT P. CAMERON
British Messier Ltd.
Gloucester, England

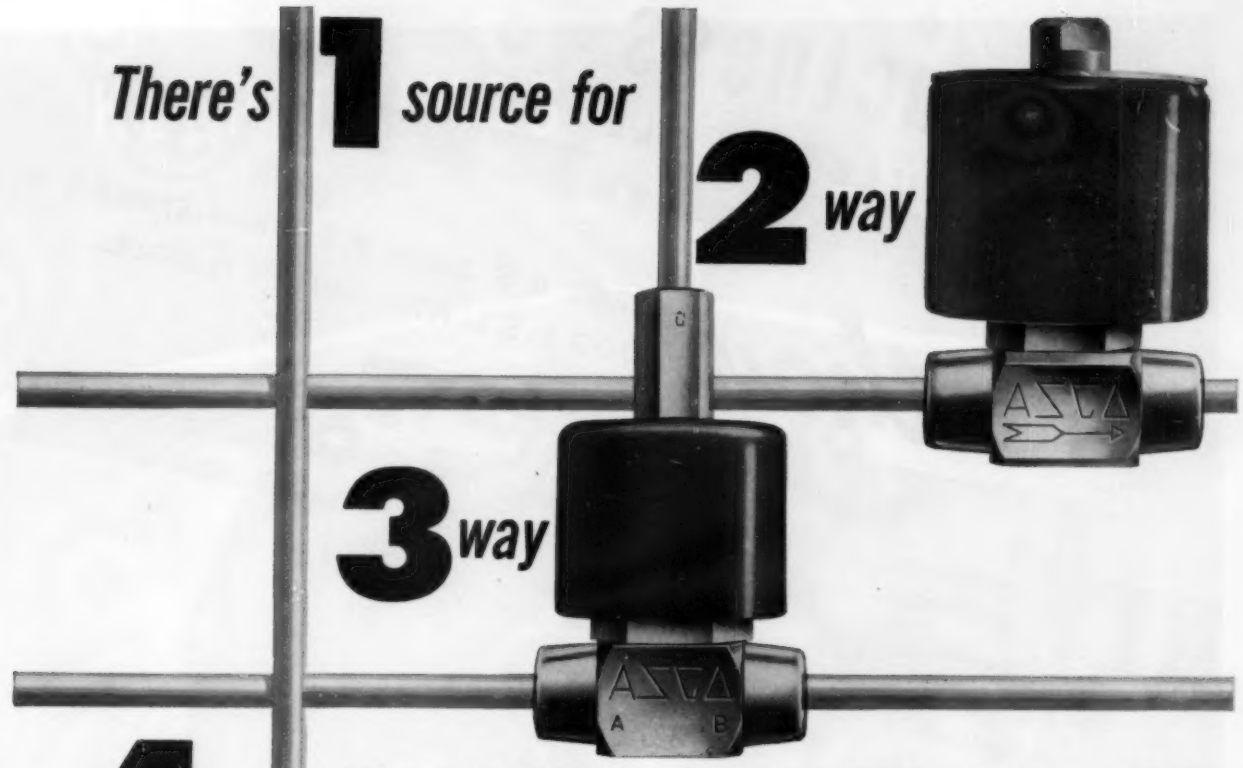
Information about this experimental fluid will be sent to you by the Oronite Chemical Corporation of San Francisco.

Could you advise me where I could obtain information on Lindol Hydraulic Fluid.

E. C. NIEZ
Automatic Transportation Company
Chicago, Ill.

This fluid is a product of Celanese Corporation of America. Information on physical properties and chemical composition has been forwarded to you.

There's 1 source for 2 way 3 way or 4 way MIDGET SOLENOID VALVES

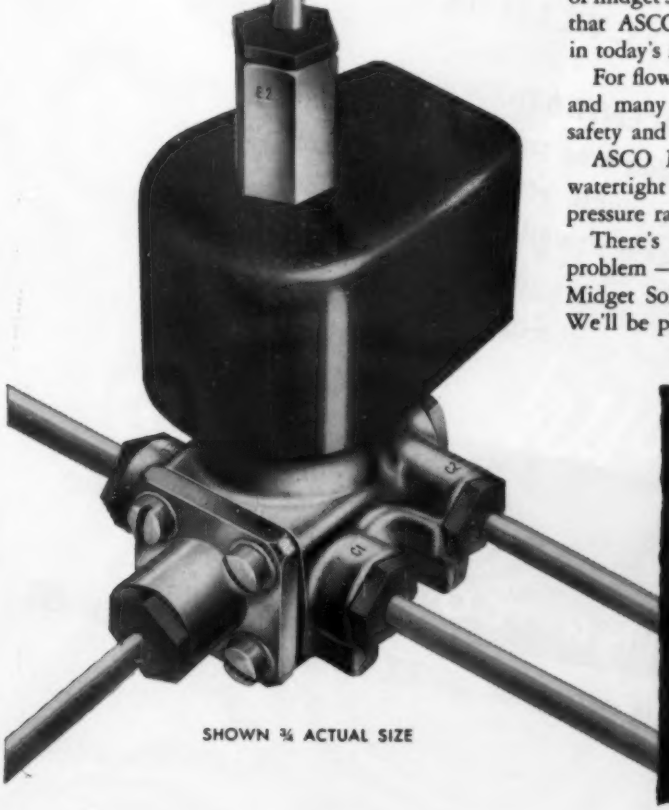


Progressive designers, the men who lead the trend toward miniaturization, depend on ASCO as the one source for a full line of midget solenoid valves. The unexcelled quality and dependability that ASCO pioneered in the solenoid valve field is found, too, in today's midget solenoid valves. Only the size has been reduced.

For flow applications using air, gas, water, light oil, refrigerants and many other liquids, ASCO Midget Valves assure complete safety and truly exceptional performance.

ASCO Midget Solenoid Valves are available with standard, watertight or explosion-proof enclosures. Pipe sizes ⅛" and ¼"; pressure range 0-1000 psi.

There's *one* source that solves virtually any solenoid valve problem — ASCO. Write today for complete data on ASCO Midget Solenoid Valves — or outline any of your requirements. We'll be pleased to assist you.



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ASCO®

Automatic Transfer Switches
Electromagnetic Controls
Solenoid Valves

Automatic Switch Co.

165-H Lakeside Avenue • Orange, New Jersey

Circle 10 on Reader Service Card

Compactness

IS THE RULE ON ALL

Pathon

SERIES R H 2000 P.S.I. and SERIES Q H 1000 P.S.I. HYDRAULIC CYLINDERS

On all of your hydraulic cylinder applications the appropriate Pathon cylinder will give you the minimum in mounting size with increase strength and fatigue life.

A PATHON HYDRAULIC CYLINDER HAS...

LOW STRESS CONCENTRATION through the head to barrel attaching area providing a plus factor for shock loads. The single screw thread attaching method gives maximum strength in minimum space.

Our new thirty-two page bulletin covering these cylinders is now being distributed. Write for your copy.

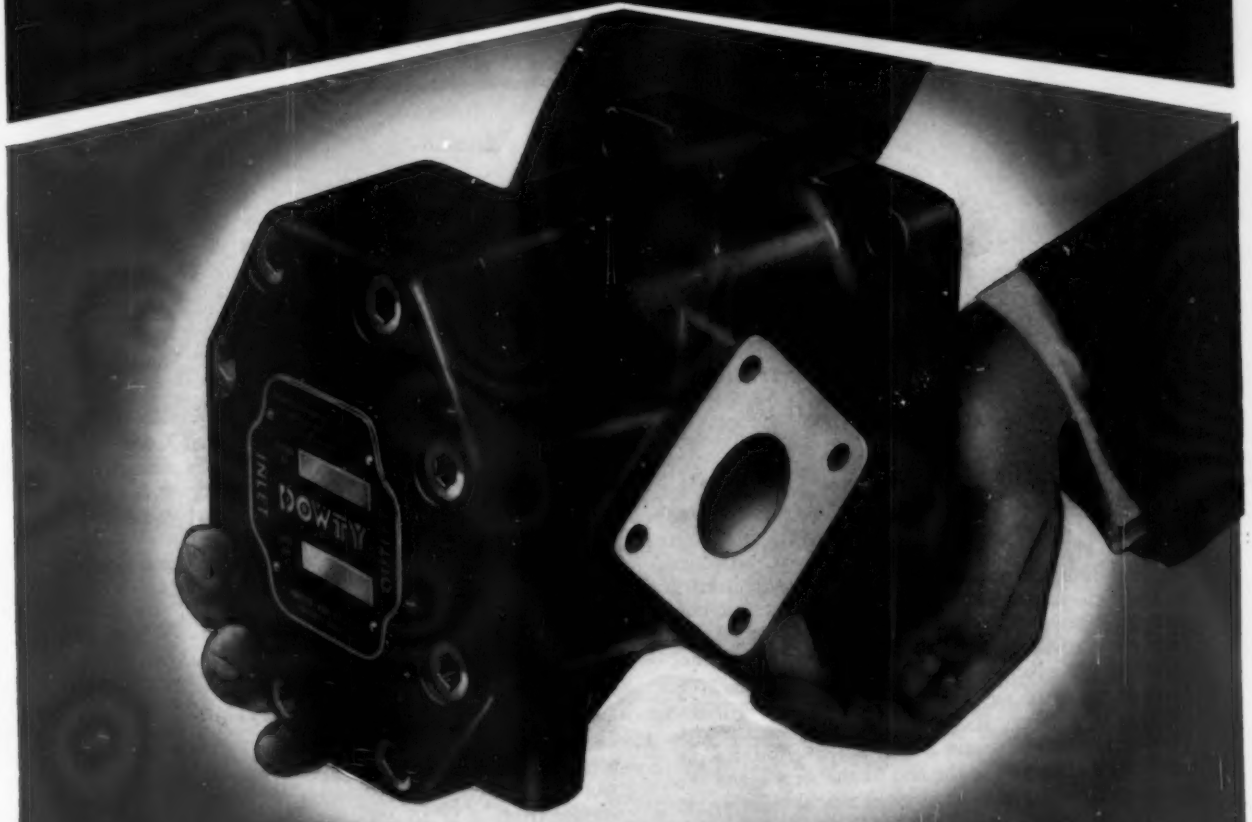
Pathon
MANUFACTURING CO.

3823 PACIFIC AVE.
CINCINNATI 12, OHIO

AIR CYLINDERS...HYDRAULIC DIRECTIONAL CONTROL VALVES...HYDRAULIC CYLINDERS

KEEP THINGS

under better control



Dowty hydraulic components of high efficiency and low cost are keeping heavy work under finger-tip control.

These pumps are available in fourteen sizes from 1 to 50 gals/min. with pressures up to 2,500 p.s.i.

British Overseas Patents pending.

DOWTY

hydraulics

FOR INDUSTRY

PUMPS • RAMS • CONTROL VALVES • COUPLINGS

DOWTY HYDRAULIC UNITS LIMITED • ASHCHURCH • GLOS • ENGLAND

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DOWTY EQUIPMENT OF CANADA LTD. • AJAX • ONTARIO
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Circle 39 on Reader Service Card

Useful Literature

For your free copy of publications reviewed, fill in the reader service card

RELIEF VALVE . . . Catalog sheets containing technical information for a new design relief valve are available from Fluid Controls, Inc. These cartridge style valves are for controlling pressure in clamping or feed circuits, especially where pressure is controlled by a continuous flow through the relief valve. Outstanding features for this series are fast response, long life, and quiet operation. The valves are available in ranges from 10-30 psi to 200-600 psi in ⅜, ½, and ¾ inch sizes.

Circle No. 176 on Reader Service Card

ACCUMULATORS . . . of the cylindrical floating-piston type are presented in a catalog available from Superior Hydraulics Div., Superior Pipe Specialties Co. The 3000 psi accumulators range in size from 3 to 1470 cu. in. oil volume and have a pressure-balanced inner shell which acts as a gas container and protective cover. A chart is given for each model showing the oil volume at various operating pressures and preload air pressures. The maximum possible potential energy is also computed for each model. The accumulators contain a dash pot to eliminate the tendency to hammer at the end of the stroke, and the entire swept volume of the unit is available for work.

Circle No. 177 on Reader Service Card

PACKING DATA . . . Types of packings used for the many hydraulic and pneumatic installations found in the steel industry are described in a new bulletin now available from E. F. Houghton & Co. Entitled "Houghton Packings for Steel Mills", the bulletin contains data on such packings as V's, U's, cups, flanges, O-rings, back-up washers, gaskets, diaphragms, and special shapes. Suggestions for use of leather, rubber-impregnated leather, and fabricated (duck and rubber) types are discussed.

Circle No. 178 on Reader Service Card

HYDRAULIC PUMPING SYSTEM . . . consisting of a motor, pump, check valve, relief valve and reservoir is available as a unit and described in Bulletin HPU-2 issued by John Dusenbery Co., Inc. The compact unit has a delivery ranging from 0.5 to 2.8 gpm and has pressures preset at the factory. Pressure and return line connections are for ⅜-in. OD flared tubing, but ¼-in. hose coupling or pipe thread connections can be supplied. Either a 5-pint or 3-gallon reservoir mounted on an open, totally enclosed or explosion-proof motor is available.

Circle No. 179 on Reader Service Card

COMPRESSED AIR DEHYDRATOR . . . The Dehydrafilter manufactured by the Hankison Corp. is described in bulletin C-5154. The unit is designed for small volumes of compressed air serving liquid level indicators, purge assemblies, remote control installations, and dead-end service applications. The bulletin gives specifications of three models and lists several applications for the units.

Circle No. 180 on Reader Service Card

VALVES . . . including needle, globe, plug, relief, and check valves are shown in a new 64-page catalog available from Republic Manufacturing Co. The catalog includes many new items including 6000 psi selector valves, 10,000 psi needle valves, adjustable gage snubbers, and plug valves with Teflon plugs for service from –65° to 250°F without the need for a lubricant.

Circle No. 181 on Reader Service Card

HYDRAULIC GAGES . . . Specifications and general information about gages manufactured by the Star-Martin Gage Co. are available. The information sheets include photographs illustrating the scale face and operating mechanism of one model gage. Information concerning construction is also presented.

Circle No. 182 on Reader Service Card

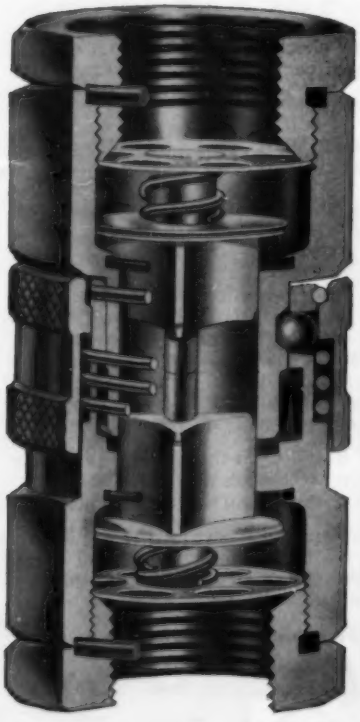
HYDRAULIC PRESSURE TUBING . . . is included in an educational manual issued by the Michigan Seamless Tube Co. The publication lists chemical composition and physical properties required by JIC for hydraulic tubing as well as weight formulas, steel analyses, and other data pertaining to the specification and ordering of tubing.

Circle No. 183 on Reader Service Card

For more reviews of Free Literature turn to page 144

DISCONNECTED IN 1 SECOND

and NO DANGEROUS SPRAY



INSTALL SNAP-TITE "H" COUPLINGS:

- Snap-Tite "H" Series couplings are constructed so that the valve is completely closed in coupler before disengaging the nipple seal, eliminating fluid spray, and the only loss of fluid is the few drops in the nipple cavity.
- Powerful springs keep valves shut tight when "H" couplings are disconnected.

Check your couplings. Are they creating accident hazards and losing costly fluids? Are offensive odors and flammable gases escaping from them?

SNAP-TITE'S "H" COUPLING, SIZE FOR SIZE, IS THE SMALLEST COUPLING WITH HIGHEST STRENGTH AND HIGHER EFFICIENCY

Recessed valve washers . . . fluted valve stems . . . valve stops with minimum flow restrictions . . . large inside diameter—these combine to allow maximum flow capacity with lowest pressure drop.

Available in sizes ⅛" to 10" in alloy steel or to specifications

SNAP-TITE COUPLINGS CAN HANDLE ALMOST ANYTHING THAT FLOWS

See the Snap-Tite representative in your city or write for Bulletin 240A

Snap-Tite, INC.
UNION CITY 1, PENNSYLVANIA

Logan

Air-Draulic®

FEED CONTROLLED CYLINDERS

Combine The Fast-Acting, Economical Low-Pressure Operation Of ..... **AIR**

With The Smooth, Uniform Controlled Regulation Of..... **OIL**

... for Pushing, Pulling, Pressing, Clamping, Holding, Lifting, and Other Power Movements In Any Direction

5 STANDARD MOUNTING TYPES

Standard bores from 3" to 8". Any stroke to 5'. For air pressure to 150 psi. Power movement in any direction. No power unit required. Feeds as low as 1.150 ipm; lower speeds special on request.

NO POWER UNIT REQUIRED

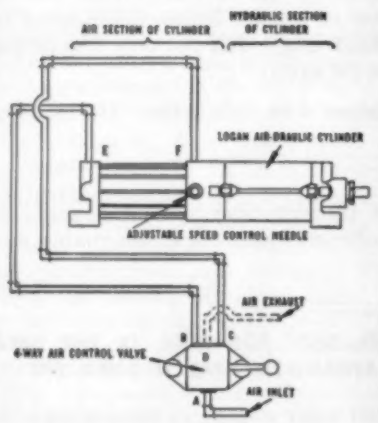
Basically, Logan AIR-DRAULIC® Cylinders are *air cylinders*, and may be used wherever compressed air is available. Yet they provide the smooth, uniform, controlled feed which is normally obtained only in *hydraulic cylinders*.

Reduced to its simplest terms, the Logan AIR-DRAULIC Cylinder is an integral unit consisting of an air piston and a hydraulic piston mounted on a single rod. The thrust or pull of the rod is obtained by means of the air cylinder, controlled by a valve or valves in the usual manner. The two chambers in the hydraulic cylinder are connected externally in a self-contained circuit; an adjustable speed control valve in this circuit regulates the flow of oil and hence the speed of the rod stroke.

Rapid return is made possible by a check valve in the hydraulic piston, permitting unobstructed oil flow on the return stroke. *Controlled feed in both directions* is also available by omitting the check valve. *Skip-feed* can be obtained through the use of cam valves applied externally in the hydraulic circuit.

The hydraulic circuit is self-contained, and no power unit is required. Logan AIR-DRAULIC Cylinders can be equipped with an automatic oil filler if desired.

Member—National Tool Builders Assn.
National Fluid Power Assn.



Basic AIR-DRAULIC Circuit with 4-Way Control Valve No Power Unit Required

HOW TO INSTALL AIR-DRAULIC CYLINDERS

The basic circuit for installation of Logan AIR-DRAULIC Cylinders is shown at the left. The air section of the cylinder is connected in the same manner as a standard double-acting air cylinder, a 4-way air control valve, piping and a connection to the main air line being required. A hand-operated air valve is illustrated, but foot-operated or other types of air valves may be used. The hydraulic section of the cylinder is a self-contained circuit and requires no additional equipment or connections.

Piping is arranged from ports B and C on the air valve to ports E and F, respectively, on the air section of the AIR-DRAULIC Cylinder. Port A is the air inlet port and port D the exhaust.

The desired piston speed is obtained by setting the adjustable needle on the hydraulic section of the cylinder. Controlled speed may be obtained on the out-stroke, the in-stroke, or both, through the internal arrangements of the hydraulic cylinder.

Let Logan engineers help you design your Air and Hydraulic Circuits. No obligation.

LOGAN MANUFACTURES 7,023 STANDARD CATALOGED ITEMS

FREE CATALOG ON REQUEST

AIR CONTROL VALVES, Cat. 100-4 • AIR CHUCKS, Cat. 70-1 • AIR CYLINDERS, Cat. 100-1 • AIR-DRAULIC CYLINDERS, Cat. 100-3 • AIR and HYDRAULIC PRESSES, Cat. 51 COLLET GRIP TUBE FITTINGS, Cat. 200-5 • HYDRAULIC CONTROL VALVES, Cat. 200-4 HYDRAULIC CYLINDERS, Cats. 200-2; 200-3 • HYDRAULIC POWER UNITS, Cat. 200-1 SURE-FLOW COOLANT PUMPS, Cat. 62.

Logan

LOGANSPORT MACHINE CO., INC.
832 CENTER AVE., LOGANSPORT, IND.

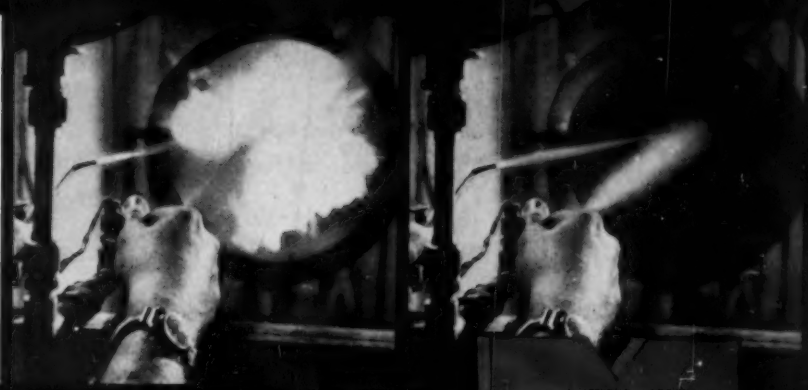
HYDRAULIC DANGER ZONE

Ordinary hydraulic fluid, escaping under pressure, can start a fire 40 ft. or more from a broken line! Is your plant safe? Here's how one firm protects men and machines inside the danger zone . . .

THE SPANG-CHALFANT PLANT of THE NATIONAL SUPPLY CO. switched to fire-resistant Pydraul F-9 hydraulic fluid after a line break involving flammable fluid caused a furnace shutdown, damaged electrical connections and lost 6 hours' production time. The plant operates this Hagan Rotary furnace continuously while a hydraulic boom containing 800 gallons of Pydraul moves white-hot billets in and out of 2250°F. heat. Recently, Pydraul's safety was proved when a ruptured hose sprayed fluid over hot billets and furnace. Result: No damage, no injuries and no time lost! *Pydraul: Reg. U. S. Pat. Off.*

PROOF OF PYDRAUL SAFETY

In photo at left, ordinary hydraulic fluid sprayed into oxyacetylene torch burns explosively. At right, Pydraul does not!



FREE! New 19-page technical booklet, "PYDRAUL F-9," gives facts on Pydraul tests, advantages, properties, uses and installation. Mail coupon to: Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Box 478-Y-1, St. Louis 1, Mo.

MONSANTO
CHEMICALS — PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

SECO hydraulic VALVES IN STOCK

Simplex Engineering has had many years of experience in designing hydraulic circuits, and in building all types of hydraulic power and control systems. We have always used the most suitable components obtainable for each application – regardless of who the manufacturer might be. This we still do. Hence we well realize that there are many good *valves* of every type. We have, however, designed numerous valves for our own use – where there was evident a real need for lower cost, or greater simplicity, or the ability to perform at higher pressures. These valves we manufacture in quantity, *and carry in stock*. They are for sale "off the shelf".

SAFETY RELIEF VALVES

For limiting operating pressures. Six models—500 to 10,000 PSI—each adjustable within limits. Chatterless. Relief set by adjusting screw. Hooded, and provided with lock and key.

HIGH PRESSURE CHECK VALVES

Simple ball check passes flow in one direction only. Designed for pressures up to 10,000 PSI.

HANDWHEEL SET RELIEF VALVES

Ideal where quick and frequent adjustment of pressure is required. Three models — 1,000 to 6,000 PSI.

UNLOADING VALVES (Not Illustrated)

Designed to insure high pressure pump unloading at all times except at the interval when pressure is needed.

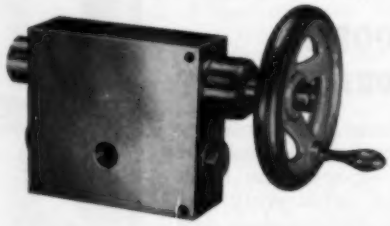
PILOT OPERATED CHECK VALVES

Basically a check valve, but allows free reverse flow when pilot pressure is applied. Seven models cover flow range of 6 to 100 GPM. Max. operating pressure 6,000 PSI.

PILOT OPERATED BLOCKING VALVES

Similar to valve described above except that pilot section is externally drained. For use where back pressure occurs in the inlet line. Models cover same range as Pilot Operated Check Valves.

HIGH PRESSURE 4-WAY VALVES



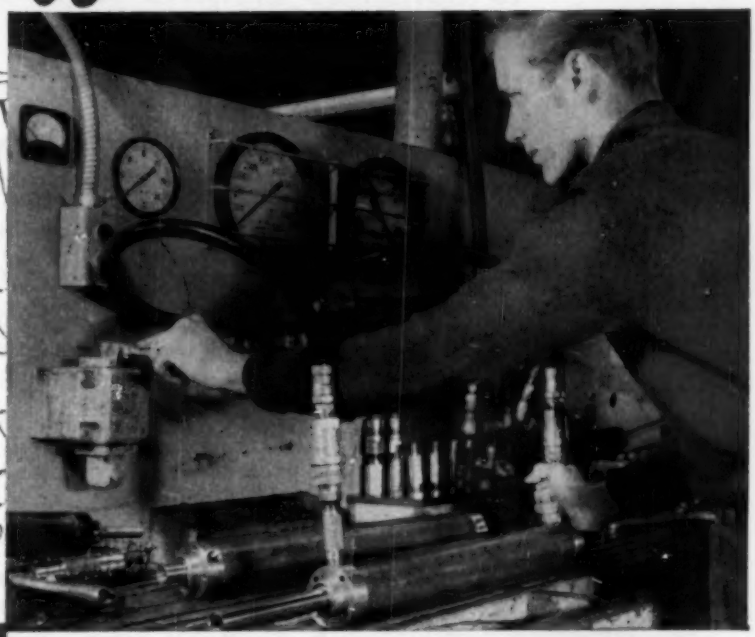
For manual control of many simple hydraulic circuits involving double-acting cylinders. Permits fine graduation of pressure and volume. Body is forged steel. Pressures up to 10,000 PSI.

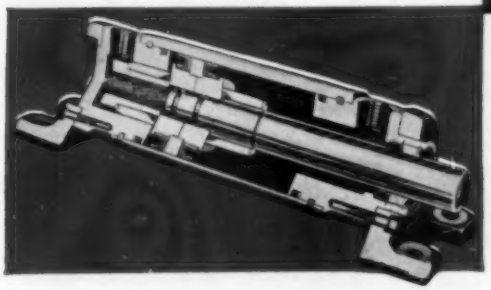
If you use hydraulic valves you should have the SECO Catalog. Use the reader's service card.

SIMPLEX ENGINEERING CO.
ZANESVILLE, OHIO

PRE-TESTED!

to assure dependable performance





and O-M CYLINDERS fit where others won't

mail coupon now!

for FREE catalog, complete set of ½-scale templates, showing all cylinders, mounts and mounting brackets.

O-M CYLINDERS (air • hydraulic)

Complete testing facilities at our modern new assembly plant take the guesswork out of cylinder performance. Before shipment every O-M Air and Hydraulic Cylinder is "power-tested" and approved, assuring dependable prolonged service under all normal operating conditions.

Standard, semi-standard, "special" air and hydraulic cylinders available in full range of sizes (1½" to 8" bores) with standard, 2 to 1 or oversize rods. Completely interchangeable parts.

Immediate delivery on many sizes.

ORTMAN-MILLER MACHINE COMPANY
1 143rd Street, Hammond, Indiana

☐ Have representative call ☐ Send latest catalog ☐ Send ½-scale templates

Name_____ Position_____

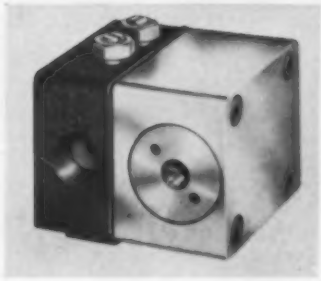
Company_____

Address_____

City_____ Zone____ State_____

New Products

Components, tools and equipment for fluid power systems. For more information fill in and mail post card bound in this issue.



AIR VALVE
. . . cartridge type

Design: Valve is extremely simple in construction having an air-surrounded piston that becomes unbalanced and shifts its position as air is bled momentarily from one side. This shifting actuates a D-type, nylon slide directing the air flow through the parts in the valve base to delivery or exhaust. Air leakage is lessened by the lapped surfaces between the nylon slide and the stainless base plate. The nylon slide is spring-loaded and automatically compensated for wear.

Features: To solve various work problems any combination of valve actuators may be used, directly attached to the valve or mounted in a remote position. Solenoids for all standard voltages and frequencies in explosion-proof and water-proof enclosures are available. Integral speed throttles of balanced type give smooth hydraulic-like action to air cylinders.

Carter Controls, Inc.
Lansing, Illinois

Circle No. 250 on Reader Service Card

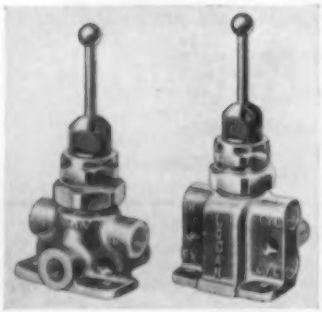
EXPLOSION-PROOF MOTOR
. . . to new NEMA specification

Designation: Type E, Type EN

Design: Motor meets specifications of National Board of Fire Underwriters and is designed to operate in extremely dangerous atmospheres of inflammable gasses, volatile liquids, and combustible dusts. Conduit box is securely sealed and is of extra heavy design with split dome. Internal bearing caps are extended along the shaft to insure against any spark traveling to the exterior. The frame is solid, one-piece cast iron with external ribs for reinforcement and rapid heat dissipation. Motor is of double-threaded design to insure a complete seal. Type E is equipped with sparkproof aluminum fan; type EN is without fan. Models are available from 1 to 5 hp.

U. S. Electrical Motors
Los Angeles, California

Circle No. 251 on Reader Service Card



TOGGLE VALVES
. . . for air control

Designation: Models 6664, 6665, 6676

Features: Model 6664 is for control of bleeder and pilot-operated master valve. Removing plug in center port makes 2-way valve into 3-way valve. Operated by hand, the valve locks in the off-center position and is released manually to the vertical off position. Model 6665 for dual control has two exhaust openings which permit bleeding both ends of master valve alternately. This provides automatic reversal when toggle lever is returned to normal position. Model 6676 is 4-way, 2-position with locking toggle lever designed for manual control of double-acting air cylinders. Valve locks at off-center position to maintain position of cylinder at end of stroke. Manual or automatic (trip dog) release to vertical position reverses cylinder movement.

Logansport Machine Co. Inc.
Logansport, Indiana

Circle No. 252 on Reader Service Card

Continued on page 57

MARVEL Synclinal FILTERS

SUMP TYPE (Cutaway)

For Efficient Filtration of–
Hydraulic Oils
Fire Resistant Hydraulic Fluids
Coolants – Lubricants
Water

OVER 550
Original Equipment Manufacturers Install Marvel Synclinal Filters as Standard Equipment

LINE TYPE (Cutaway)

PROTECT EQUIPMENT
INCREASE PRODUCTION
REDUCE MAINTENANCE

Marvel Synclinal Filters installed in the sump or on the line preceding pump offer maximum protection on all hydraulically actuated and other equipment utilizing low pressure circulating oil systems. Maintenance and production costs are reduced because Marvel Synclinal Filters BALANCED design offers greater ACTIVE filtering area with sufficient storage capacity for filtered out damaging particles, thus, longer periods of productive operation are attained at minimum "down time" due to maintenance and repairs.

PRODUCTION ENGINEERS and MAINTENANCE MEN whose job it is to keep production machinery operating at peak efficiency and who have recognized the superiority of Marvel Synclinal Filters in the filtration of hydraulic oils, fire resistant hydraulic fluids, coolants, lubricants, etc. are specifying Marvel Synclinal Filters on all new equipment and standardizing with Marvel Synclinal Filters on all machines within their plants.

Another outstanding reason for their preference is the simple construction of Marvel Synclinal Filters which allows them to be easily disassembled, thoroughly cleaned and reassembled on the spot, by any workman in a matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connections.

Catalogs containing complete data available on request

A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple installation (as was described in catalog). Choice of Monel mesh sizes range from coarse 30 to fine 200.

IMMEDIATE DELIVERY!

As in the past, Marvel continues to offer Immediate Delivery!

VISIT OUR EXHIBIT
BOOTH #802
at the 6th National
MATERIALS HANDLING EXPOSITION
International Amphitheatre
Chicago, Illinois
MAY 16-20, 1955

MARVEL ENGINEERING CO.
625 W. JACKSON BLVD., CHICAGO 6, ILL.
PHONE: FRANKLIN 2-4431 & FRANKLIN 2-3530

Without obligation, please send me complete data on Marvel Synclinal Filters as indicated:

Catalog No. 106 for Hydraulic Oils, Coolants, Lubricants
Catalog No. 300 for Water
Data on filters for fire-resistant hydraulic fluids

AH-5

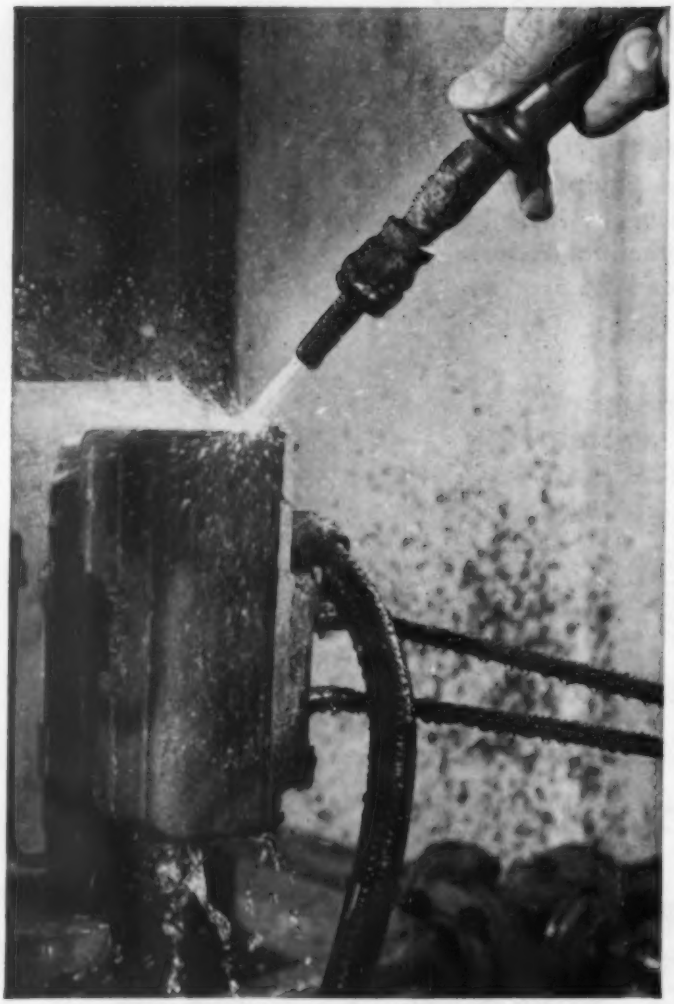
Name ..... Title .....

Company .....

Address .....

City ..... State .....

SHEDS WATER LIKE A DUCK'S BACK!



A BATH A DAY doesn't affect this solenoid air valve. It's a MAC with a sealed cover—and it's been operating under conditions like this at Corn Products Refining Company for two years without a hitch.

Spray away! This solenoid-operated air valve is waterproof. For over two years at the Corn Products Refining Company, Argo, Ill., it's been used to operate the cylinders that empty starch vats. There, where everything must be kept spotless, it's been hosed down regularly along with a battery of identical MAC air valves. And, unlike the ordinary type that had been on the job before, not a single MAC has failed to operate perfectly . . . none has *ever* needed maintenance.

Originally built to special order, MAC valves with gasket-sealed covers are now standard in many sizes. They protect both the solenoid and valve mechanism against dirt and dust, as well as moisture . . . making them ideal for foundries, food processing plants, or wherever grit, oil, coolant, water and the like play havoc with valve operation.

If you have an application that requires a *superior* air control—sealed or not—telephone a MAC representative listed at the right.

You'll find all MAC controls simple in design, compact, easy to service without touching the piping. You'll find MAC valves cost less . . . perform better . . . last longer than any air control you've ever used, too. Telephone your representative or write for free literature.

MECHANICAL AIR CONTROLS, INC.
10030 Capital, Oak Park, Detroit 37, Michigan

MAC

PHONE YOUR NEARBY "MAC" REPRESENTATIVE FOR DATA AND DELIVERY

CALIFORNIA
OAKLAND 8—The Rucker Co., 4700 San Pablo Ave., OLympic 3-5221
SOUTH GATE—The Rucker Co., 4956 Firestone Blvd., KImball 8271

ILLINOIS
CHICAGO 43—Mechanical Air Controls, 10336 South Western Ave., Hilltop 5-3640

INDIANA
FORT WAYNE 3—Neff Engineering Co., P. O. Box 2001, Station A, 2339 Crescent Ave., EAstbrook 7391
INDIANAPOLIS—Jack Neff, 42nd St. Station, P. O. Box 7361, HUmboldt 6421
SOUTH BEND—Dick Futter, 103 South Varsity Dr., 2-4856

MASSACHUSETTS
BOSTON 34—Electrical Apparatus Co., Inc., 1200 Soldiers Field Rd., STadium 2-7440

MICHIGAN
BAY CITY—Fred Kober, 506 Chilson St., 2-2629
FLINT—Kober Sales Engineering Co., 514 Beach St., CEdar 8-5123
GRAND RAPIDS—Kober Sales Engineering Co., 190 Monroe Ave., GLendale 4-3252

MINNESOTA
MINNEAPOLIS 4—Air Engineering & Supply Co., 2445 Nicollet Ave., FIlmore 5579
ST. PAUL 14—W. H. Schulz Co., 2438 Franklin Ave., MIdway 2744

MISSOURI
ST. LOUIS 14—Oscar E. Jost Co., 10920 St. Henry, HArrison 8-4488

NEW YORK
BUFFALO 21—C. H. Tepas Co., 200 Washington Hwy., CIrcle 3210
NEW YORK 7—C. H. Ribble Co., 261 Broadway, WOrth 4-6227

OHIO
CINCINNATI—The R. W. Nichols Co., Fidelity Federal Savings Bldg., 2087-9 Sherman Ave., Norwood, ELmhurst 2440
DAYTON—The R. W. Nichols Co., 407 Realty Bldg., Michigan 4724
OLMSTED FALLS—The R. W. Nichols Co., P. O. Box 6, BErea 4-1379
TOLEDO 4—The R. W. Nichols Co., 510 Manhattan Bldg., MAin 8623
YOUNGSTOWN 3—The R. W. Nichols Co., 202 Schwenn-Wagner Bldg., RIverside 4-4550

OREGON
PORTLAND—The Rucker Co., 911 N. W. Hoyt St., BEacon 0205

PENNSYLVANIA
PHILADELPHIA 4—Grand Air Hydro Div., K. Wm. Ostrom & Co., Inc., 3717 Filbert St., EVergreen 2-5444
PITTSBURGH 22—The R. W. Nichols Co., 101 Investment Bldg., ATlantic 1-6050

TEXAS
DALLAS 19—Womack Machine Supply Co., 6409 Maple Ave., DIxon 6997

WASHINGTON
SEATTLE—The Rucker Co., Whyte-Henry-Stuart Bldg., Rm. 203, MAin 2783

WISCONSIN
MILWAUKEE 10—Neff Engineering Co., 2837 North 50th St., Hilltop 5-3340

CANADA
ONTARIO, HAMILTON—Higginson Engineering Sales, P. O. Box 23 (275 James, North), JAckson 9-2262

MECHANICAL AIR CONTROLS, INC.
DETROIT 37, MICHIGAN

MAC

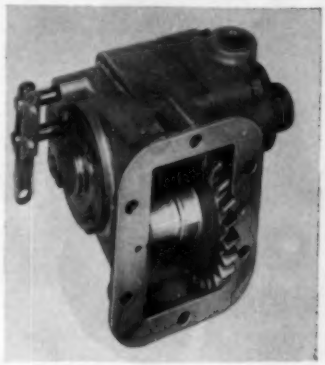
New Products

continued

PUMP POWER TAKE-OFF . . . for mobile equipment

Applications: For truck dump bodies, tail gate lifts, hydraulic loaders, fifth wheels, spreaders, etc.

Features: Pump is integral with power take-off eliminating universal joints and drive lines. High



speed ratio of drive gives maximum delivery at minimum truck engine speed.

Specifications: Two pump sizes are available: 1.38 cu.in. displacement delivering 6 gpm, and 1.80 cu.in. displacement delivering 8 gpm. Both pumps are rated at 1000 rpm and 1000 psi.

Muncie Parts Mfg. Co.
Muncie, Indiana
Circle 253 on Reader Service Card

THICKNESS CONTROL . . . for Teflon seals

Features: By accurate control of web and lip thickness some very successful sealing applications are being accomplished with Teflon

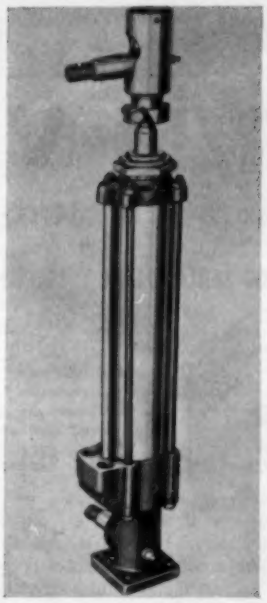
parts. This produces the degree of flexibility required in thin-section members to take advantage of Teflon's sealing properties. The thickness of the sealing portion which governs flexibility can now be controlled and coordinated with application requirements.

Sparta Manufacturing Co.
East Sparta, Ohio
Circle 254 on Reader Service Card

HYDRAULIC STEERING BOOSTER . . . offers compactness and safety

Designation: Series S23

Design: Compactness has been achieved by new servo control valve design and relocation of hydraulic connections. Booster is available either with or without relief valve. Installation is simplified by the reduced diameter, and mounting adaptability is provided by a sym-



metrical control ball stud housing that can be assembled in any one of four different positions.

Features: The steering booster transmits all road shock to the chassis, so that the steering wheel cannot be jerked out of the driver's control on rough roads.

Specifications: Available in two models with 7 and 12-inch maximum strokes. Booster has 3000 lbs rated thrust at 600 psi. Maximum operating pressure is 1000 psi.

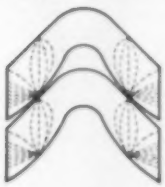
Vickers Inc.
Detroit, Michigan
Circle 255 on Reader Service Card

Continued on next page

R/M VEE-FLEX®

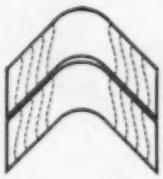
America's most copied packing

GIVES YOU SEALING LIKE THIS



Simplified diagram of stress trajectories in R/M Vee-Flex Rings with convexly curved surfaces.

INSTEAD OF LIKE THIS



Simplified diagram of stress trajectories in ordinary V-type rings with flat contact surfaces.

The success of R/M Vee-Flex, outstanding in hydraulic service, is due to its special design, which distributes pressure laterally against the stuffing box wall and shaft as well as longitudinally against the next ring. This is accomplished by R/M's unique convexly curved surface on the pressure side of the packing. Photoelastic analyses,* corroborated by radial pressure tests,* prove that maximum sealing performance occurs at a point slightly below mid-width on the sealing area. For complete data, including a table of sizes, write for R/M Vee-Flex Bulletin. And if you have a packing problem, call on R/M's specialized engineering service.

Performed at The Franklin Institute Laboratories for Research and Development

R/M PACKINGS

RAYBESTOS-MANHATTAN, INC.

PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Packings • Asbestos Textiles • Industrial Rubber, Engineered Plastic, and Sintered Metal Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks Clutch Facings • Fan Belts • Radiator Hose • Bowling Balls

New Products / continued

TIMER
. . . calibrated in percentage

Design: Timer is equipped with visible dial, snap-action switch with silvered contacts, and a synchronous motor. Unit is 5x3x3 inches.

Features: Percentage selection of "on" or "off" time gives advantage of constant accuracy in repeated operation. Turning the pointer is the only adjustment required. Timer has cycle of from 15 seconds to 24 hours with a range of adjustability for "on" or "off" periods up to 94%.

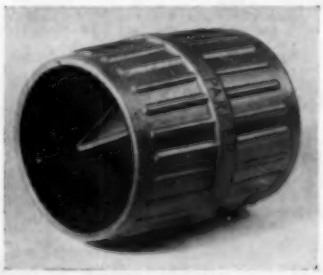
Zenith Electric Co.
Chicago, Illinois

Circle No. 256 on Reader Service Card

BURRING TOOL
. . . for burring tubing

Designation: "In-Ex"

Design: Burring tool incorporates three hollow-ground cutting blades conically arranged in each end.



Applications: "In-Ex" is a hand tool for burring both internal and external edges of copper, brass, aluminum, or annealed steel tubing, ranging in size from 3/16 to 1½ OD. Tube is inserted into one

Continued on page 60

select the CORRECT FLOW REGULATOR

from the large variety of sizes, types and materials available from WATERMAN

If accurate flow control of hydraulic oil under varying pressure conditions is a requirement—a WATERMAN FLOW REGULATOR is the answer.

- Fixed flow regulators can be set to control from 0.1 GPM to 80 GPM.
- Semi-adjustable regulators can regulate flows from 0.2 GPM to 40 GPM.
- Full range adjustable regulators can regulate flows from 0.5 to 20 GPM.
- For corrosive fluids, WATERMAN FLOW REGULATORS can be manufactured from brass, bronze, naval bronze, stainless steel, titanium, or any known machinable metal.

Send for these free FLOW REGULATOR BULLETINS

WATERMAN ENGINEERING COMPANY

725 CUSTER AVENUE • EVANSTON, ILLINOIS

Circle 151 on Reader Service Card

Here is How

CATERPILLAR®

uses

BARCO

Swivel Joints

ADVANTAGES

1. **VERSATILE.** Barco Swivel Joints solve many piping problems where leakproof flexible connections are needed to allow for movement, overcome misalignment, and guard piping against vibration, strain or shock.
2. **NO BINDING.** Up to 10° side flexibility with 360° swivel movement. Low torque; easy turning. No lubrication required.
3. **MANY STYLES AVAILABLE.** For pressures to 3,000 psi; temperatures to 600° F. Sizes ⅜" to 2".
4. **PRESSURE-SAFE; FIRE-PROOF.** Joints have high safety rating and develop no dangerous pressure thrust.
5. **COMPACT.** Easy to install. Require less space than other types of flexible connections.

ASK FOR BULLETIN No. 265A

—*on* HYDRAULIC CONTROL *Lines*

■ THIS photograph illustrates the use of a *self-aligning* Barco Swivel Joint on the hydraulic connection between a Caterpillar Diesel DW10 Tractor and W10 Wagon. The male end of the joint screws directly into the king pin (arrow) in the main hydraulic pressure operating line between the tractor and the wagon. It is used at the pivot point in place of a long length of hose. At this point, it provides complete flexibility for turning and sideways movement of the wagon without placing any strain on the 300 psi pressure piping.

Rugged Barco Swivel Joints are ideal for this kind of service because they stay leakproof and require no lubrication or attention over long periods of time. This is one of thousands of different applications where Barco joints are used to solve piping problems in industry. *When you need flexible piping connections on machinery, check with Barco.* Worldwide Sales and Service. BARCO MANUFACTURING CO., 532F Hough St., Barrington, Illinois.

BARCO

THE ONLY TRULY COMPLETE LINE OF FLEXIBLE BALL, SWIVEL, SWING AND REVOLVING JOINTS

New Products / continued

end of the tool for inside burring and into the other end for outside burring.

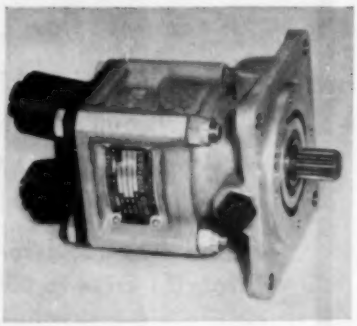
Parker Appliance Co.
Cleveland, Ohio

Circle No. 257 on Reader Service Card

HYDRAULIC MOTOR . . . for aircraft applications

Designation: Models M-1401, M-1501, M-1601

Design: Motor contains nine axial pistons operating against an inclined, hydraulically balanced thrust plate. A shaft supported by antifriction bearings provides a dynamically stiff drive to a rotating barrel containing the pistons. Ruggedness and simplicity is obtained with a unique split housing which permits the use of only four bolts to assemble the unit. Precision bearings and a carbon nose contact seal provide leakproof shaft seal. Low moment of inertia permits rapid reversal.



Specifications: Two models are rated .348 and .510 cubic inches displacement per revolution, 6 and 7 lb, 4000 rpm, 3000 psi, and develop 9.7 and 14.6 hp respectively. Developed torque is 163 and 236 in-lb respectively. Overall dimensions are 3 inches square by 4¾ and 5¼ inches long. Motor conforms to Specification MIL-M-7997.

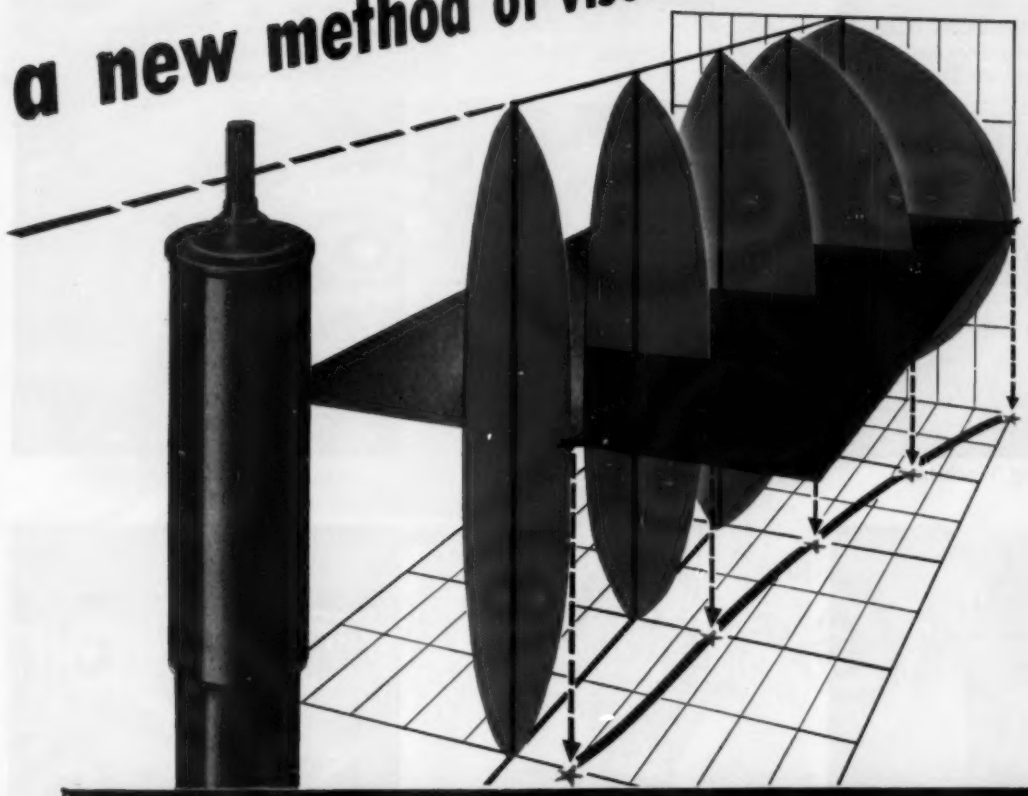
United Hydraulics Inc.
Dayton, Ohio

Circle No. 258 on Reader Service Card

For more NEW PRODUCT reviews turn to page 126

THE GABRIEL TRIGRAPH*

a new method of visualizing hydraulic damping device performance



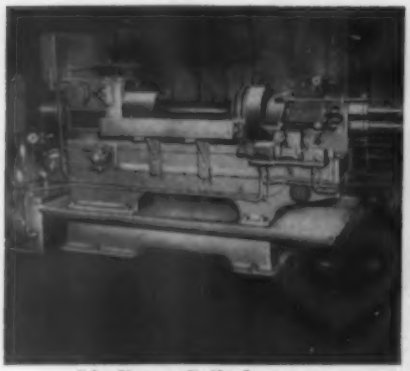
The Gabriel Trigraph* shown here combines an infinite number of closed circuit diagrams into a single three-dimensional graph from which the load-velocity curve of a hydraulic damping device is easily visualized and plotted. In isometric form, it is used in planning the performance of a hydraulic damping device to meet specific requirements.

The Gabriel Trigraph* is described in detail in a new book published by The Gabriel Co., the leader in the design and production of hydraulic damping devices. This book — "DAMPING DEVICES — PAST, PRESENT, FUTURE" — is the first book providing a comprehensive review of the application of hydraulics to the solution of automotive and industrial damping problems. It encompasses the fundamental scientific principles employed in controlling linear or oscillatory motion, and provides detailed information on the design, operation and application of modern hydraulic damping devices. "DAMPING DEVICES — PAST, PRESENT, FUTURE" is available without charge. Write, wire or call —

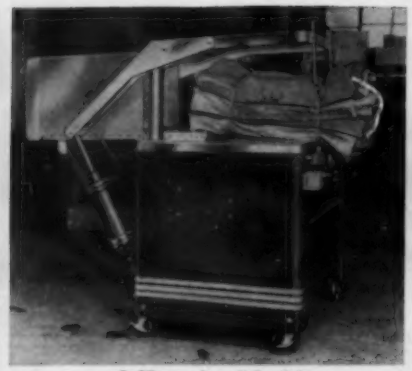
*Trademark

THE GABRIEL COMPANY

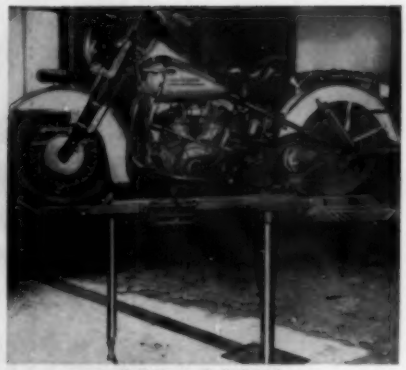
1148 EUCLID AVE · CLEVELAND 15, OHIO



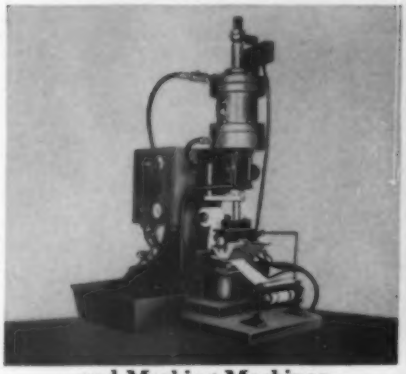
Lindberg Cylinders are used on Machine Tools



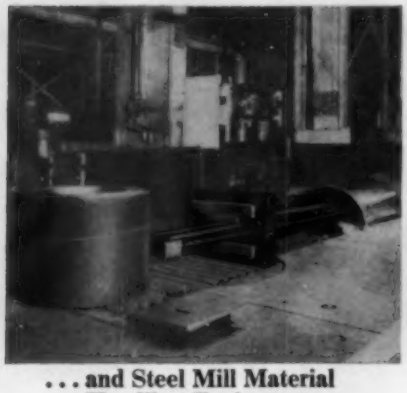
. . . and Clamping Machines



. . . and Material Lifting Equipment

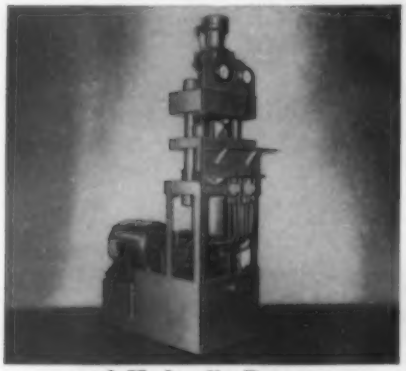


. . . and Marking Machines

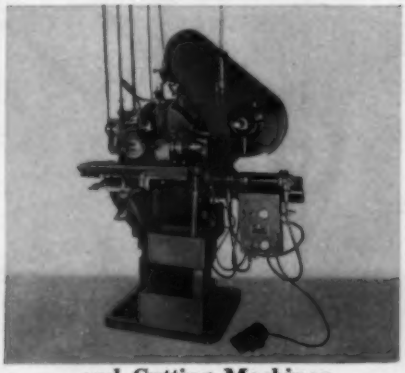


. . . and Steel Mill Material Handling Equipment

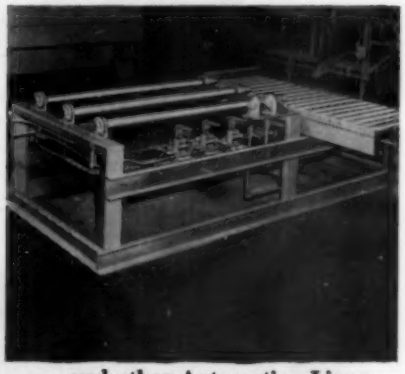
. . . and Heat Treating Furnaces



. . . and Hydraulic Presses



. . . and Cutting Machines



. . . and other Automation Lines

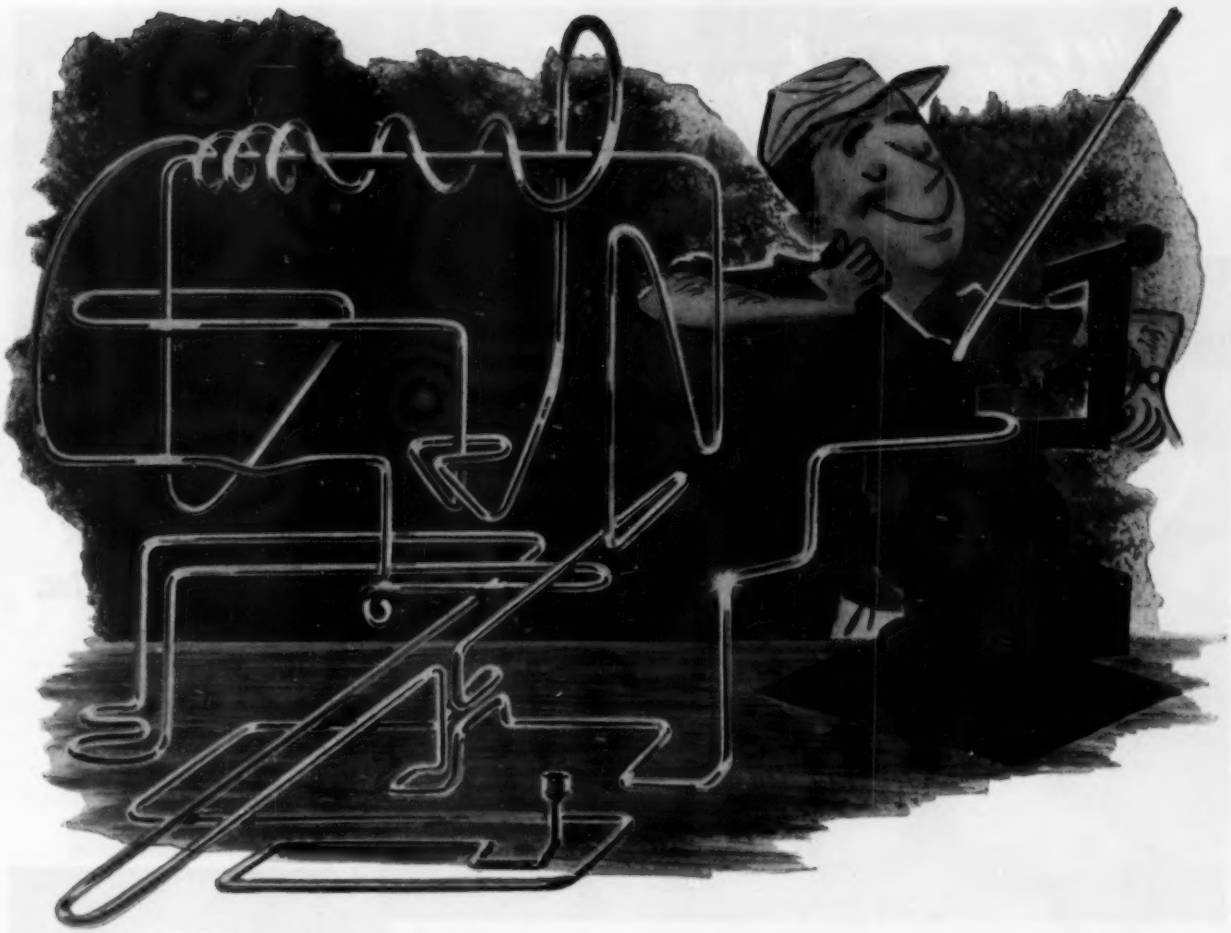
Push...Pull...Lift...Clamp

When original equipment needs muscle, manufacturers use LINDBERG cylinders

Lindberg offers a complete line of Air and Hydraulic cylinders. All cylinders available to meet J.I.C. standards. Ask for bulletin No. 800.

LINDBERG AIR..HYDRAULIC CYLINDERS

Lindberg Air and Hydraulic Division, Lindberg Engineering Company, 225 North Laflin Street, Chicago 7, Illinois



No Hydraulic Tubing job's too tough for us!

What's your hydraulic tubing problem? Unusual shapes? Special sizes or specifications? Whatever your problem, we're in a position to help you in a special way.

Our research, production and sales teams are small enough to give you the kind of personalized service that gets results when nothing else can. And they're big enough to get volume production going in a hurry on the special tubing you need.

Our modern plant is flexible, versatile and completely equipped to produce almost any type of cold drawn seamless tubing you can name—and produce it to *your* specifications. What's more, every operation at Summerill is laboratory controlled to give you consistent peak quality of product with every tube.

Why not let us tackle *your* hydraulic tubing problems? We'll welcome the opportunity to show you how Summerill Seamless Tubing can improve product quality and reduce costs. Address: Summerill Tubing Division, Columbia Steel & Shafting Co., Pittsburgh 30, Pa.

WBD 5478

Summerill

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HARTFORD • MILWAUKEE • NEW YORK
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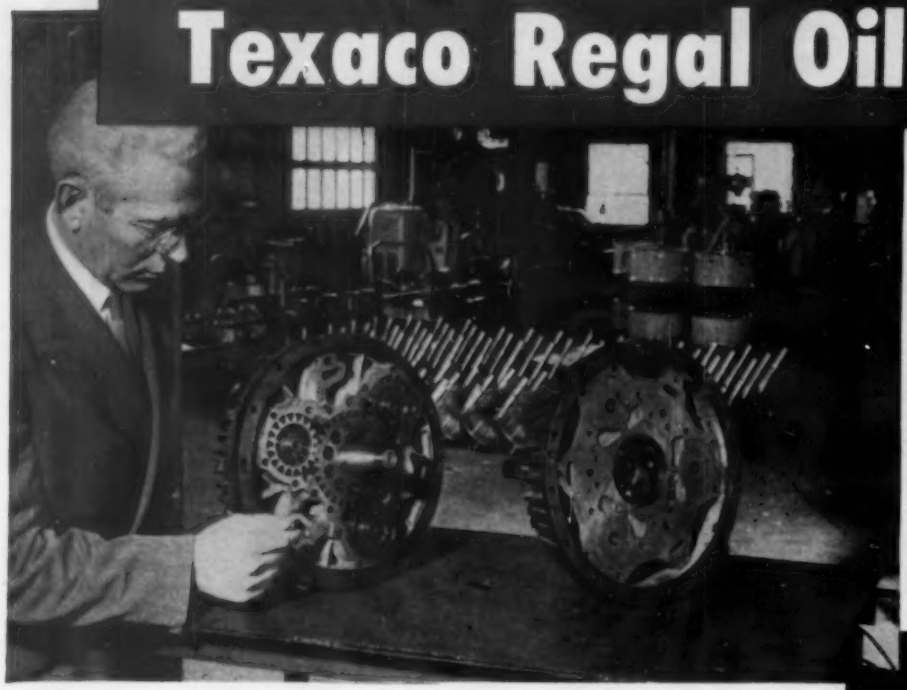
HYDRAULIC TUBING • SPECIAL TUBING • MECHANICAL TUBING • DIESEL TUBING • PRESSURE TUBING • AIRCRAFT TUBING

"Here's why we factory-fill our VariDRAULIC drives with Texaco Regal Oil R&O"



—says John Thomas, Chief Engineer, Thomas Hydraulic Speed Controls, Inc. Wichita, Kansas

This disassembled Model SRA VariDRAULIC Drive," explains Mr. Thomas, "was installed on a wheat harvesting combine in 1949. After five years' use, harvesting wheat from Texas to North Dakota, the operator reported that the drive had never been opened, had never given a moment's trouble, and no oil had ever been added. We asked the operator to return it.

"Inspection revealed the excellent condition of the VariDRAULIC Drive and the *Texaco Regal Oil R&O*. All components looked just like new and unused parts. And the *Texaco Regal Oil R&O* itself—which had never been changed or added to—was clean and clear, despite the fact that the drive operated at times in excess of 210 degrees F., and the oil capacity of this drive is only seven quarts."

Hydraulic manufacturers and operators everywhere report similar fine results with *Texaco Regal Oil R&O*. This is the oil that tests prove has *more than ten times the oxidation-resistance* of ordinary turbine-quality oils—far superior ability to keep systems free from sludge, rust, foam and wear.

There is a complete line of *Texaco Regal Oils R&O*, approved by leading hydraulic manufacturers for all types of hydraulic equipment. A Texaco Lubrication Engineer will gladly help you select the proper one. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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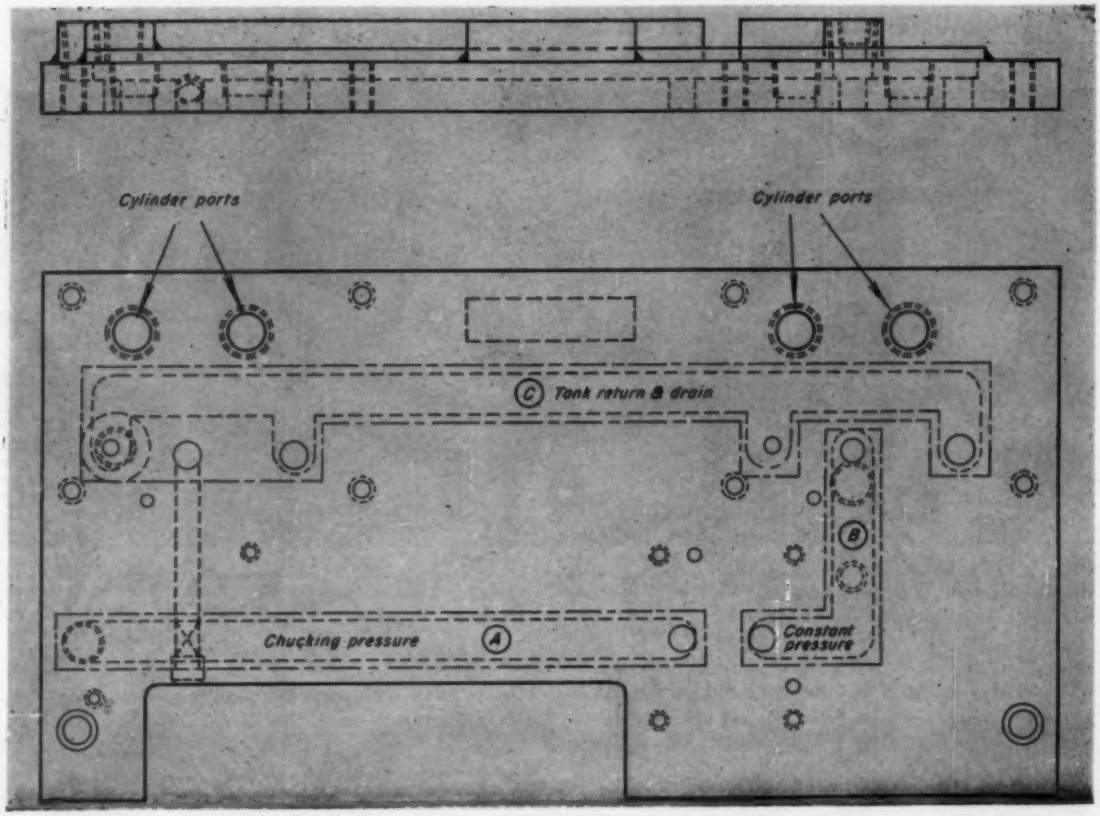


FIG. 1. DETAILS of the welded panel used on a single index chucking machine.

How to Design and Build

WELDED VALVE PANELS

• By H. W. Brown and J. H. Smith

MOST present day hydraulic panels are included in three basic types: brazed panels, cast plate panels, and drilled panels. It is not our purpose to evaluate these types beyond the point that we considered all three types to be unsuitable for our needs —on the basis of cost and size. We required a panel that was compact, economical, trouble-free and simple—and we were confronted with the job of making it ourselves. This presented the following basic problems of design:

1. What equipment was to be mounted?
2. How to position the hydraulic components?
3. How to seal-off the pressure paths?
4. How to manufacture the panel?

H. W. BROWN, *Research and Development Engineer,* J. H. SMITH, *Machine Designer, The National Acme Company, Cleveland, Ohio.*

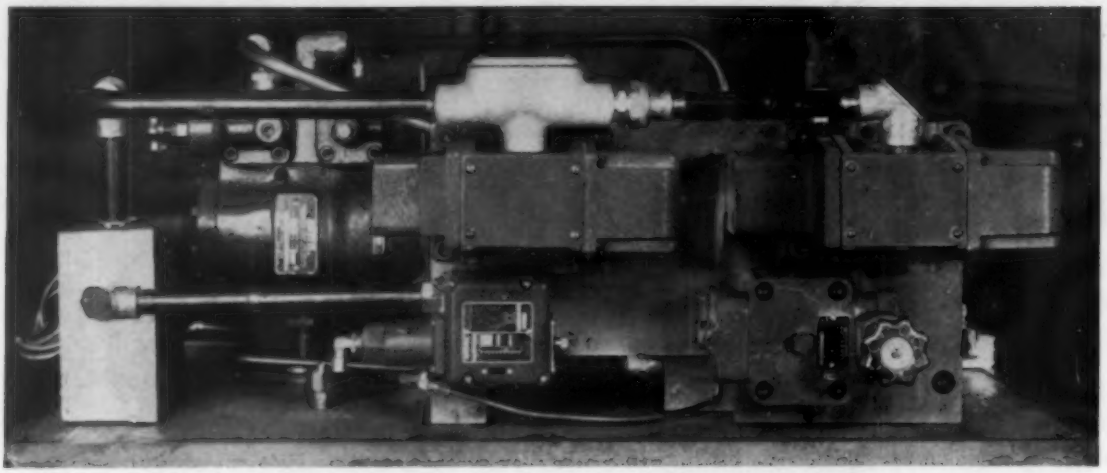


FIG. 2. Two solenoid controlled-pilot operated 4-ways, a pressure switch and pressure reducing valve are mounted on the welded panel.

In analyzing step 1, our National Acme RPA chucking machines have two solenoid operated four-way valves, two solenoid controlled pilot operated four-way valves, a pressure reducing valve, and a pressure switch. If the RPA chucker is a double-indexing model, one more or a total of three solenoid controlled-pilot operated four-way valves are required. The final decision was to mount the solenoid controlled-pilot operated four-way valves, the pressure reducing valve and the pressure switch on the panel. It was also decided to build two separate panels, one for single-index, the other for double-index machines instead of incorporating both single and double indexing into one panel. These decisions stem from the fact that we prefer to keep our hydraulic equipment as near to its functional application as possible.

DETERMINING VALVE POSITION

In step 2, we had to study the geometry of positioning these valves. Realizing that some sort of pressure and tank paths were a necessity, we analyzed, pro and con, the possibilities of the basic panel types. We had no desire to cast, mill, or drill pressure paths completely through a plate as any one or combination of several is a rather time-consuming operation. Furthermore, to sandwich this section of a panel between two other plates would create a bulky panel. Our final decision was to mill a path that was of sufficient area to carry the volumetric output of our pump. We further found out that it was easier and more economical to mill the paths straight or at right angles. In other words, the geometry of positioning the hydraulic components show that as long as the paths are parallel, or parallel and perpendicular, you can design and manufacture a panel that is economical and simple.

There are several points which require study before positioning the hydraulic equipment—make sure the component manufacturer recommends or states that his equipment will work in a horizontal, vertical, or some in between position—be sure to allow sufficient room between hydraulic components to remove any covers that the equipment may have —watch the symmetry of the electrical connections that will become part of the final panel assembly.

For more information about valve panels see:

Drilled Hydraulic Manifolds
March 1955 *pg* 62

Brazed Sandwich Manifolds
July 1953 *pg* 57

Piping and Manifold Layout
April 1953 *pg* 60

Turning to step 3, the trend of the basic panel types available offered many possibilities, but none of these were the answer to our problem. Several different methods were tried before we finally decided to seal-off the tank and pressure paths with $\frac{3}{8}$ inch and $\frac{3}{4}$ inch thick plates cut to the contour of the path. These contour cover plates are then welded to the main panel body. We use fillet welds to hold the cover plates to the main panel body and the size of fillet weld is determined by the force exerted against the contour area. Hydraulic pressures over 1500 psi can be sealed in a path by a

National Acme has found that welded hydraulic panels are most practical for their multiple spindle chucking automatics because of compactness and reduced manufacturing cost. This article presents their design and manufacturing techniques.

proper ¼ inch or ⅜ inch fillet weld. We were pleased with the results of the first panels but we will be the first to admit that there were many problems to overcome—problems such as: warpage, milling, grinding, and tapping.

These problems introduce step 4—that of manufacturing. At first the main body of the panel was finished completely, but experience proved that it was best to normalize the plate and then do all the milling, drilling and a flash grind on both faces. Actual milling of the pressure and tank paths is done by following a template that is superimposed over the panel body.

Figure 1 shows the single index panel. We use two different pressures in this panel: (A) is the chucking pressure, (B) the constant pressure path and (C) is the tank return and drain path. In welding the cover plates we obtained a bow in the main body. This bow was always in the same direction; consequently, we found that if we would stress the main body in the opposite direction and hold it there while welding the cover plates, we would have very little straightening to do in the next operation.

Continued on page 114

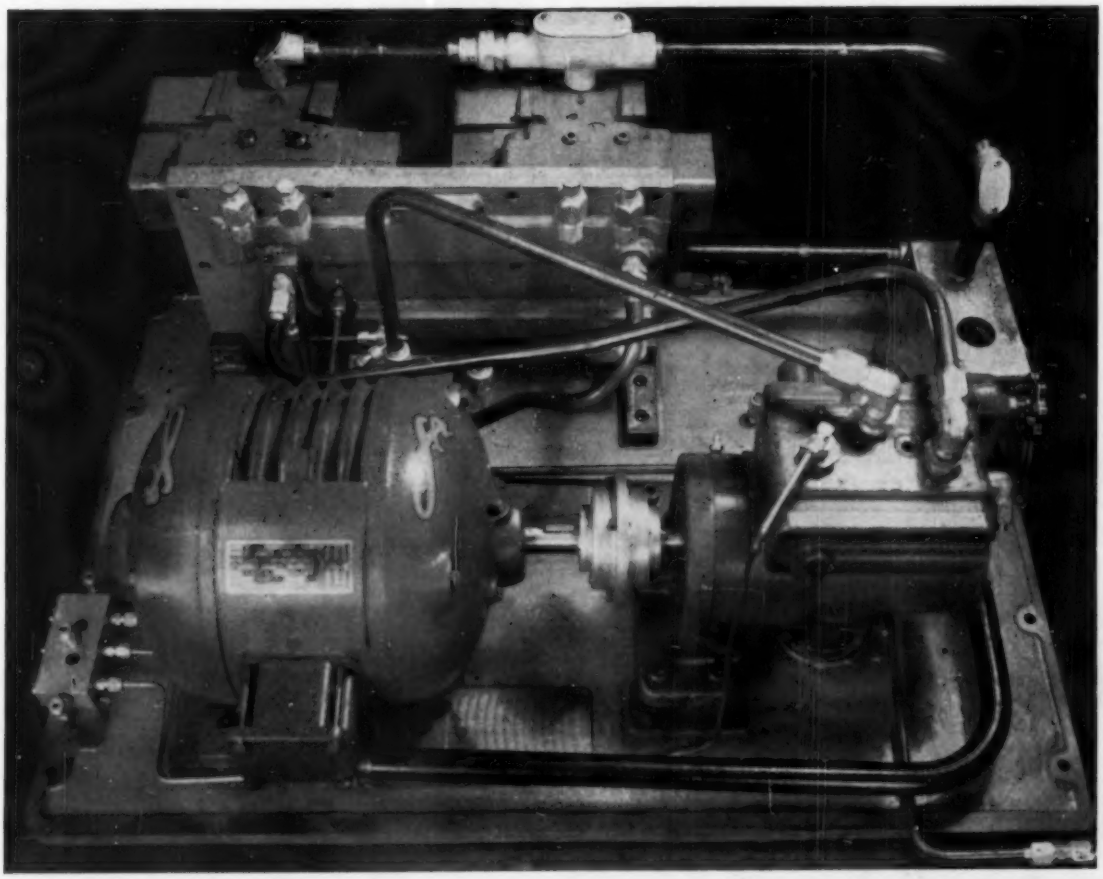


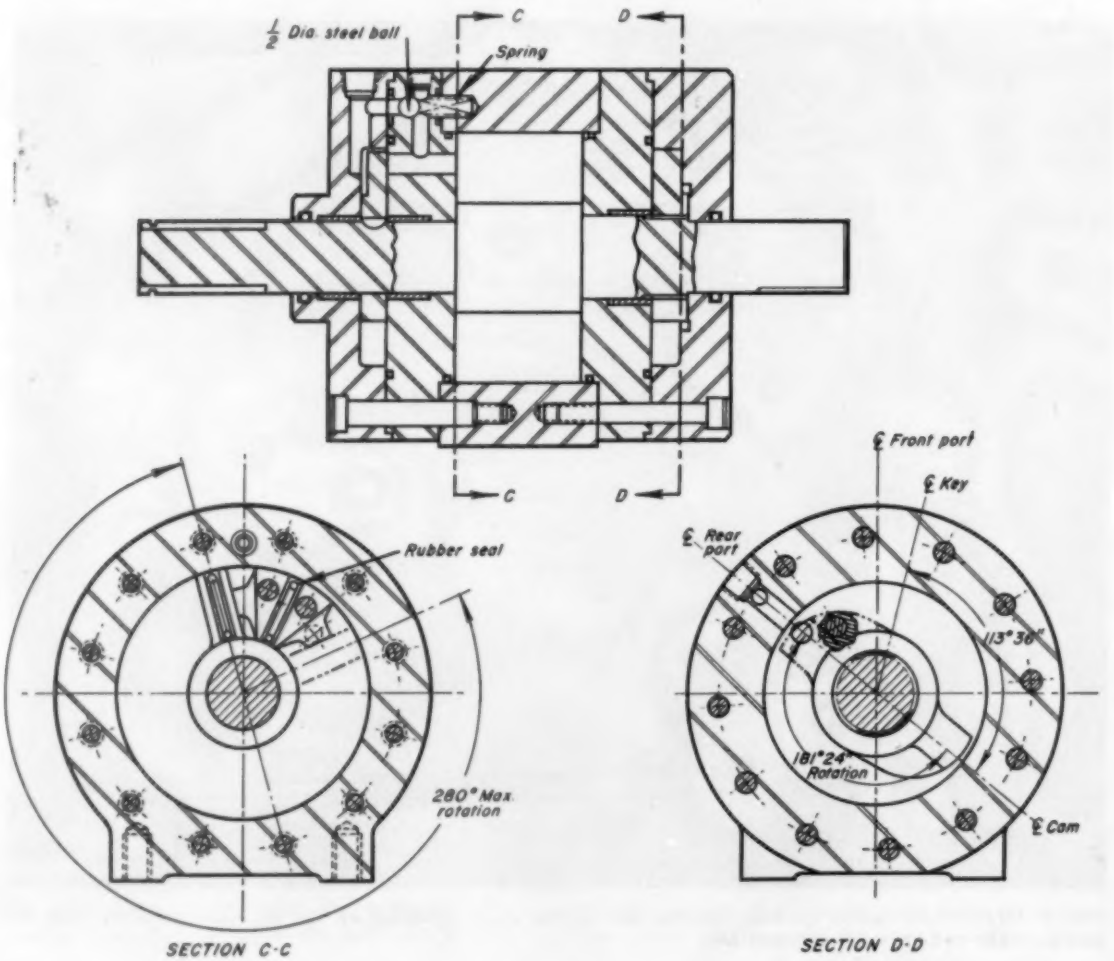
FIG. 3. HYDRAULIC power package showing the welded panel mounted on the oil reservoir along with the pump, motor and electrical junction box.

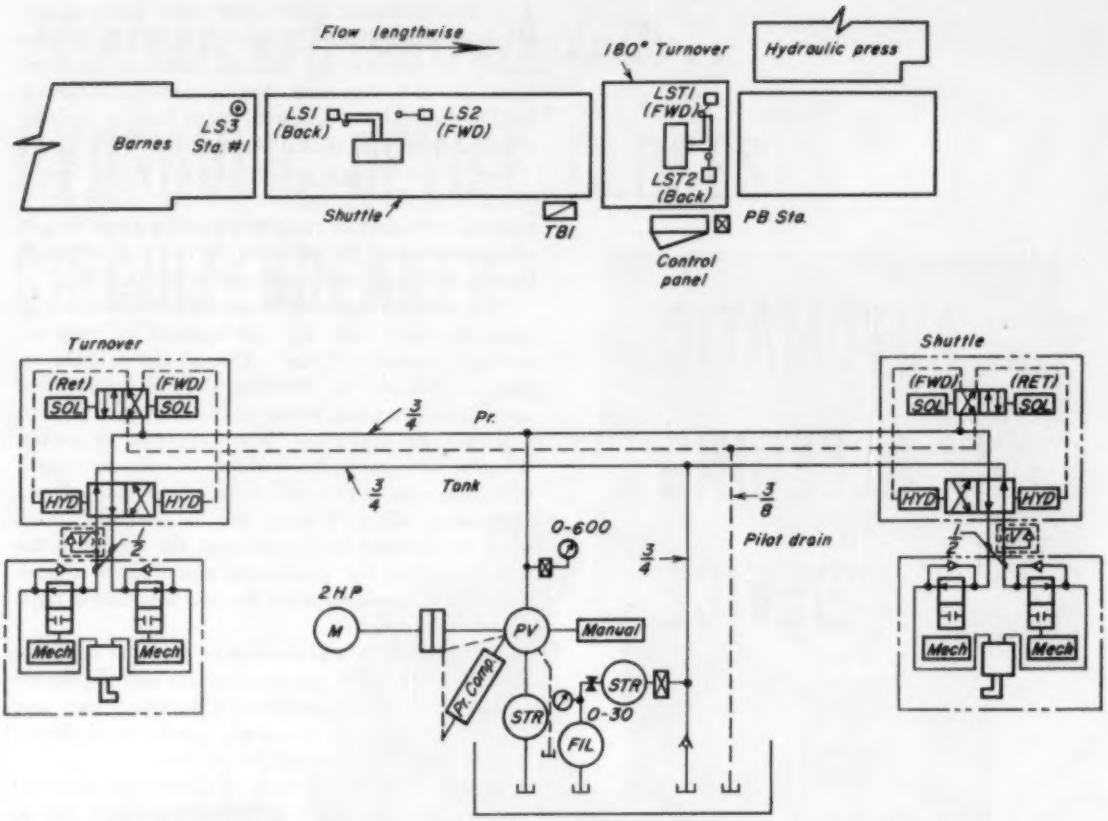
Shuttle and Turnover Transfers Use

CUSHIONED TORQUE ACTUATORS

Savings in space, and simplicity of construction resulted from using a "less-than-one-revolution" torque actuator to provide linear motion as well as turnover action on two transfer sections in an automotive production line.

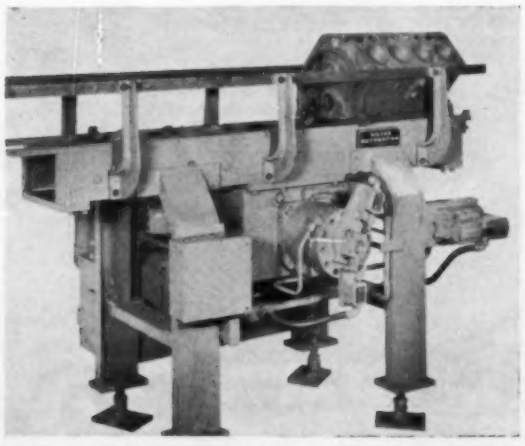
ACCELERATION AND DECELERATION control are built into this single vane rotary actuator. The cross-sectional drawings illustrate the construction. Section C-C shows the single vane welded to a sleeve which is press fitted onto the main shaft. The stationary pie-shaped stop is pinned to the end caps and serves to limit maximum rotation to 280 degrees. To provide the necessary cushioning and stroke control, two flat cams are used. The cam at the front port is fixed with a Woodruff key in a position relative to the front port. To obtain adjustment of the stroke within the 280 degree maximum, the cam adjacent to the rear port is splined to the shaft. This permits repositioning this cam within ½ degree. Section D-D shows the cam positioned to give 181° 24′ rotation. When looking in the end at section D-D, clockwise rotation results when oil pressure is on the front port and the rear port is open to tank. At the start of clockwise rotation the front port is closed by its cam and oil opens the check valve to enter the actuator chamber. As the vane moves, the cam moves away from the front port. The rear cam starts to approach the rear port. Deceleration occurs as the rear cam slowly closes off the rear port to create a deceleration back pressure. A fixed pin stops clockwise rotation. During counterclockwise rotation, oil pressure is on the rear port and the front port is open to tank.



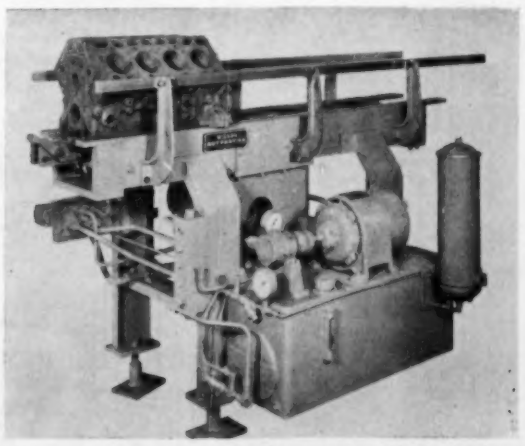


LIMIT SWITCH ACTUATED solenoid valves properly sequence the shuttle and turnover mechanism in relation to a drilling machine and a press. One 5 gpm variable volume vane type pump, driven by a 2 horsepower motor, supplies identical actuators for the shuttle and turnover devices. The built-in cushions and check valves are graphically shown as deceleration and check valves on each side of the actuator. Throttle valves are inserted between the 4-way valve and the actuator to provide meter-out control during the working stroke. The system operates at about 400 psi to develop approximately 4000 lb-in of torque at each actuator. With the small volume pump, speed of the stroke is not very fast. With both actuators moving simultaneously, the speed is about 3 seconds per stroke. Further adjustment to reduce this speed can be made by manually adjusting the pump. By-pass filtration of return oil with a screen filter and a micronic filter is in addition to a suction filter to minimize down-time caused by oil contamination.

Drawings and photos courtesy Wilson Automation Co. Detroit



TRIP DOGS, clamped to the rear end of the actuator shaft, hit limit switches to actuate the valve solenoids through suitable relays. On this shuttle transfer mechanism, the front end of the actuator shaft meshes with a gear and rack arrangement to provide linear motion. Hydraulic lines go to the gasket mounted valve from a manifold block seen welded on a leg of the frame. Lines to turnover mechanism will tie into this manifold to simplify assembly and piping.



AUTOMATIC AIR BLEEDING DEVICE

• By Albert D. Herrell

AIR in a hydraulic system can cause faulty action or complete failure of operation. While air can usually be removed by periodic bleeding, in some instances, it is apparent that an automatic device for bleeding air is desirable from both a maintenance and an operational standpoint.

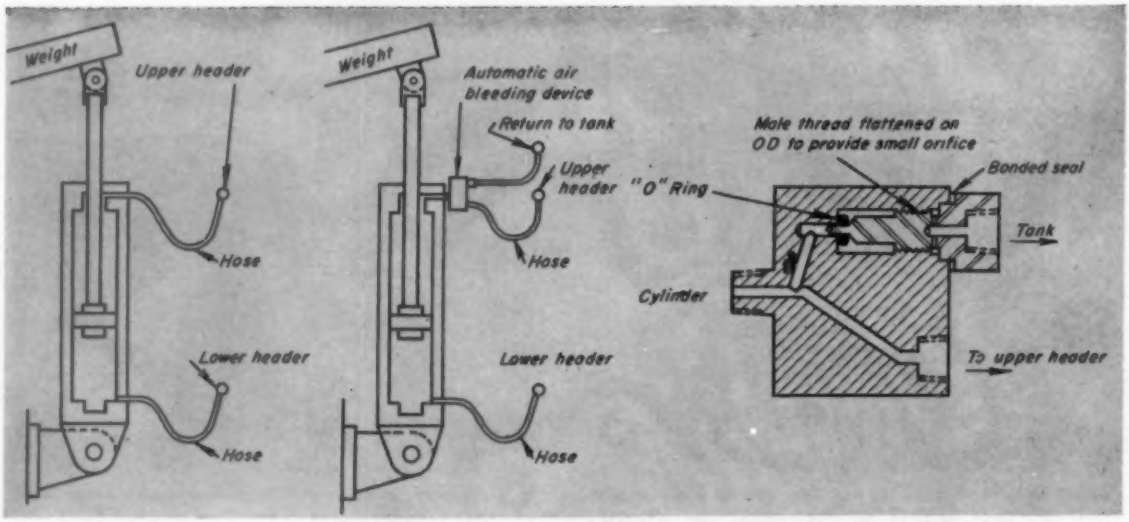
One of the design projects at the Puget Sound Naval Shipyard is a complex hydraulic system which contains cylinders to raise and lower a large weight which is located, by necessity, at the highest point. Built-in cushions are in each end of the cylinder.

The system operated reasonably satisfactorily from the start with the development of only an average amount of "bugs". One of the deficiencies was the difficulty of bleeding air and maintaining an air-free condition in the cushions of the cylinder, especially the upper one. When operated at normal velocity, with air in the cushion, the piston stopped metal to metal at the end of the stroke without any cushioning effect. Without the deceleration which must be provided by the cushion, the inertia of the weight stressed the mechanical components to such a degree that several times the rod was pulled right out of the piston.

At this point it was decided to see what could be done to remove this troublesome air and if possible keep it out. After considerable thought, time, and experimentation, an automatic air bleeding device was developed that solved the problem.

In this installation, three cylinders are mounted in parallel. The upper and lower headers are so arranged as to feed the three cylinders. A bleeding device is included with each cylinder, and in addition another is installed in each of the headers, somewhere near the center cylinder. ▼▼▼

ALBERT D. HERRELL, *Ordnance Engineer, Puget Sound Naval Shipyard, Bremerton, Wash.*



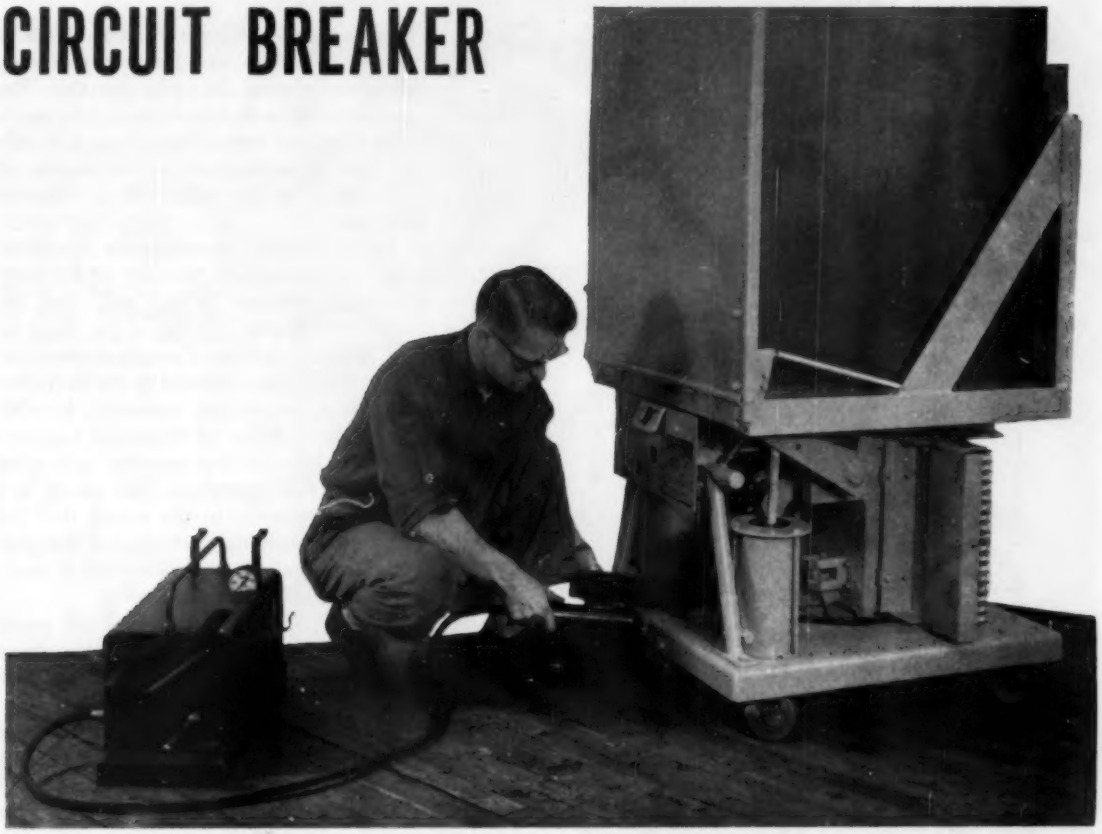
ORIGINAL CYLINDER installation without air bleed.

BLEED VALVE mounted at rod end provides air path.

O-RING in bleed valve acts as check to bleed air from cylinder.

If electrical controls fail...

HYDRAULIC DEVICE CLOSES CIRCUIT BREAKER



Here is a portable emergency device to reclose circuit breakers on an energized line with a maximum of safety.

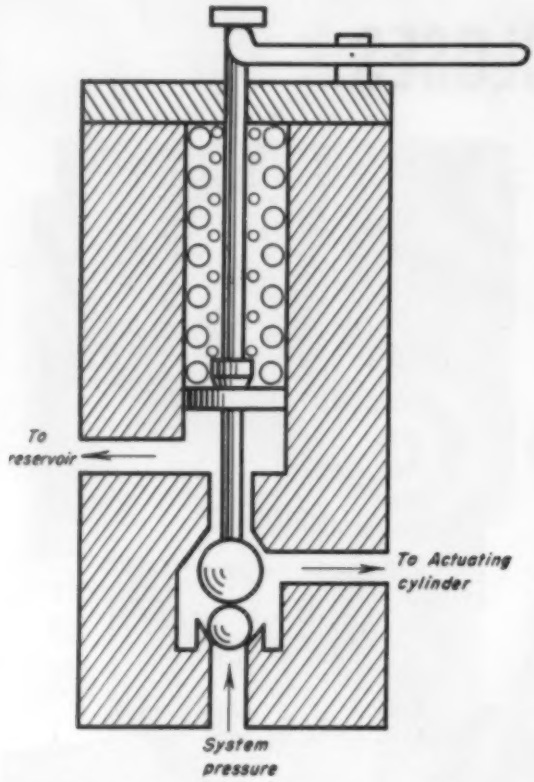
• By E. R. Perry

HYDRAULICS has found a new application in emergency devices for use during electrical power failures. A new hydraulically actuated device has been developed for closing power circuit breakers on an energized line.

E. R. PERRY, *Application Engineer, Boston Works, Allis-Chalmers Mfg. Co.*

Power circuit breakers are used to protect electrical transmission and distribution systems, and in many installations it is imperative that long service interruptions are prevented. Circuit breakers rated 250,000 kva and above cannot be safely closed by hand because of the force required. Therefore, when normal electrical control fails or control power is lost, some other means of closing the breakers must be available. A small, portable hydraulic closing

EMERGENCY POWER DEVICE



WITH BYPASS VALVE CLOSED to drain, pressure of 2900 psi is supplied by hand pump and stored in accumulator. Pushing down lever of triggering valve compresses small spring and gives effect of 100 psi fluid pressure acting against piston. Fluid pressure acting against small ball raises balls and acts against large ball. Fluid pressure of 2900 psi against large ball opens valve completely. Valve remains open until bypass valve is opened to drain. Oil then flows from spring-return actuating cylinder through check valve to tank.

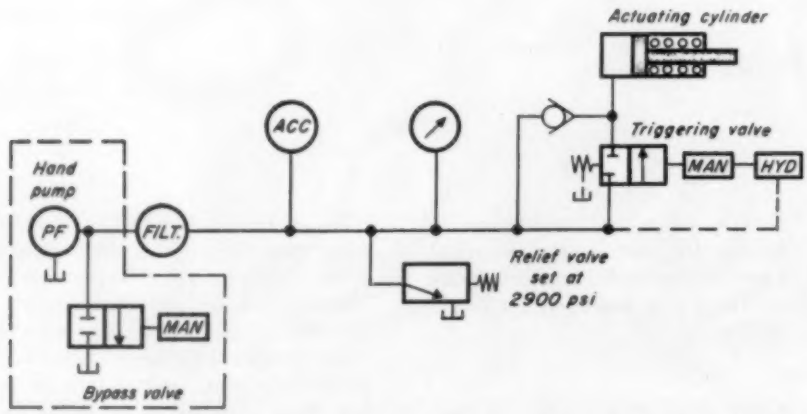
device has been developed to close circuit breakers rated 250,000 kva and above when normal means fail. Closing a circuit breaker requires a large amount of energy for a short period of time and rather precise control. The operation must be as fool-proof as possible. The reputation of hydraulics as a reliable and flexible means of transmitting energy makes this the most suitable choice as a medium for this application.

Circuit breakers are installed in various locations in power plants, substations, and factories requiring that the emergency closing device be portable. The device is small enough so that one person can easily carry it between various breaker locations, and only one emergency device is required for any number of breakers. The device is also adaptable to different types of breakers.

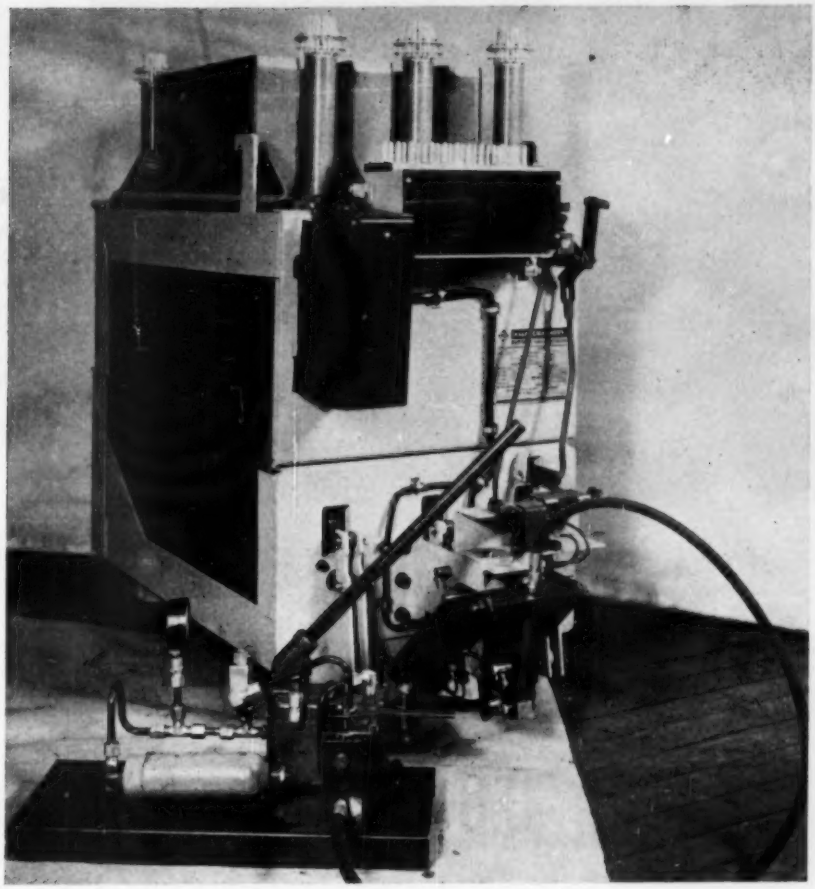
Before a circuit breaker is completely closed, an arc strikes across the contacts. Because of the large amount of energy released by this arc, once the closing operation is begun, the full stroke must be completed without hesitation. Enough energy for a complete operation must be stored in the hydraulic accumulator before the closing operation is initiated. Once the closing stroke of the device has been started, it is impossible for the operator to prevent completion of the full operation. The emergency closing device is automatic to the extent that the operator can control only the initiation of the closing stroke, and then only if enough energy is available to complete the closing cycle.

The device incorporates a hydraulic hand pump with a built-in reservoir to make the system more compact. The accumulator is a bladder type with a poppet valve arrangement in the oil port.

Several actuating cylinders and attachments are available, so that the closing device fits practically all circuit breakers presently in the field. The limited space available for attaching the actuating cylinder to the circuit breaker requires a cylinder of minimum size, and consequently a 3000 psi system is used. The actuating cylinder is connected by a 9-foot



RELIEF VALVE SET at 2900 psi prevents operation of triggering valve until lever is actuated.



CLOSING GIANT SIZE 5000 volt circuit breakers takes too much force to be done safely by hand. The small hydraulic power package does the job with little effort from an operator.

flexible hose, and quick disconnects between the hose and the actuating cylinder permit substitution of actuating cylinders for different types of breakers. This adds to the flexibility of the device, and reduces the number required where more than one type of circuit breaker is installed.

The most unusual feature of the device is the triggering valve, which acts as the brains of the system. The triggering valve utilizes a very basic and simple design yet performs several functions. The valve is so designed that a build-up of pressure by the operator will not cause the circuit breaker to close. Such action could be dangerous as the operator would never know the exact instant when the circuit breaker was going to close.

Basically the triggering valve is a poppet-type valve with steel balls as the poppet. The steel balls are spring-loaded to hold them in the closed position. Fluid pressure from the accumulator acts on the steel balls tending to open the valve. The force exerted by the fluid is balanced by the springs. and a fluid pressure of 3000 psi is required to unseat the valve. The pressure relief valve is set at 2900 psi, making it impossible for the operator to charge the system to a pressure which would open the triggering valve. When the pressure has reached 2900 psi, the operator actuates the triggering valve. This compresses the small spring in the valve and provides a force equivalent to 100 psi fluid pressure acting on the area beneath the balls. With 2900 psi pressure in the system, the valve is unbalanced and fluid entering around the small ball on the bottom acts on the area of the large ball to completely unbalance the large closing spring and open the valve. Only 700 psi pressure acting on the large ball is necessary to completely compress the valve closing spring. This ensures that the valve remains fully open and allows a free flow of oil to the actuating cylinder during the closing of the circuit breaker.

When the breaker has closed, the operator opens the bypass valve which is an integral part of the hand pump. This drains the pressure from the actuating cylinder and the accumulator into the reservoir. A spring in the actuating cylinder retracts the piston.

A constant viscosity oil is used to ensure constant operating speeds under widely varying temperature conditions. The oil is also inhibited, so that corrosive atmospheres in industrial plants will have no harmful effect on the mechanism. ▼▼▼

AIR CONTROLLED

A small 7¼ cubic inch compressor supplies all the air needs for this excavator-crane. Air at 120 psi is supplied to an air storage tank and distributed through copper tubing to and from the control valves and clutches.

CONTROL SYSTEMS FOR

• By Raymond H. Bowman

AS construction equipment becomes larger, more massive and powerful, the control system must provide more power so that the machine can be operated at an economically high rate of speed with relatively little effort on the part of the operator.

Although manual systems are of simple design and construction, they are limited in the ratio by which they can multiply the force exerted by the operator. Where compactness with high force multiplication factor is required, powered controls are used.

The most widely used power controls are hydraulic and air. Both have their advantages and limitations. Air is a free commodity which is immediately available. It requires no return system. In case of accidental leakage in the system during field operations, there is no great cause for alarm. A supply of air is always at hand and there is no fire hazard or "mess."

An air control system usually operates at pressures substantially lower than a hydraulic system. Components for the system are generally inexpensive, simply constructed and therefore easier to maintain. For instance, an air valve replacement on a Michigan excavator-crane costs approximately $15, while a similar type hydraulic valve costs approximately 2 or 3 times as much.

An air system, however, requires an air compressor and a compressed air storage tank. Provision must also be made to prevent freezing in the lines during cold weather because of moisture condensation in heated compressed air.

A hydraulic system, on the other hand, does not require a large compressor and surge or storage tank—usually only a pump and a small sump. A larger tank or heat exchanger may be required when a large volume of oil is pumped under high pressure, as in the case of large, heavy equipment. The hydraulic system can compactly provide the higher pressures necessary for successful equipment operation in many applications.

RAYMOND H. BOWMAN, *Chief Engineer, Construction Machinery Division, Clark Equipment Company.*

OIL CONTROLLED

Pressure loaded gear type pumps power the steering system and the bucket lift and tilt cylinders on this tractor shovel. A compact power package operating at 1000 psi withstands rugged service conditions.

CONSTRUCTION EQUIPMENT

Hydraulic controls lend themselves to unified design because all controls can be hydraulic while many times air controls are limited to specific parts of the machine. For instance, the torque-converter power transmission package uses oil rather than air. One oil system can then be used for the transmission and for actuating all attachments.

Using oil as the hydraulic fluid has the advantage also that it serves not only to transmit power but also as lubricant for mechanisms involved.

One other type of pneumatic system should be mentioned, and that is a vacuum system. This system, however, provides very limited power in the practical sense of the word. It is used to assist the actuation of small, light-weight mechanisms.

CONTROL SYSTEM SPECIFICATION

Controls can be classified into two groups: vehicle controls and upper works and/or attachment controls. Vehicle controls include engine and brake mechanisms. Engine controls are frequently of the mechanical type because they are economical and involve the use of simple members such as push rods. The accelerator, for instance, is almost invariably mechanically controlled. On standard transmissions, the clutch is of the mechanical type. However, the mechanical clutch is being replaced by the hydraulically actuated torque converter.

In addition to a torque converter, advanced design also includes a power transmission. Although air-powered transmissions have been designed, the hydraulic type is preferred. The latter is more desirable because it avoids the need for an auxiliary means of gear lubrication.

Brake controls are usually manual, with air or hydraulic assist. Here, again, as the machine gets larger, full air or hydraulic power is needed. A common system is the spring-loaded brake with air or hydraulic release, in which a specific pressure must be developed in the system before the brake will be released. The specific brake system chosen is generally dictated by the general control system in the machine. In other words, if a hydraulic system is used, the brake will be tied in with the hydraulic circuit and the same in the case of air controls.

Mechanical linkage is by far the dominant type for steering controls. But for high capacity machines, the trend is definitely toward power assist

steering which utilizes a booster that can be either air or hydraulic.

As differentiated from vehicle controls, upper works controls include the rotating mechanism, as in the case of excavator-cranes; tipping or dumping controls; and attachment controls for buckets, blades, shovels, booms, etc. Generally speaking, hydraulic controls are used for heavy duty applications; air and manual-power assist for the intermediate class; and manual for lighter-duty applications.

TYPICAL CONTROL SYSTEMS

Two of the most prevalent types of control systems are those typified by the air controls on the Michigan excavator-crane and the hydraulic controls on the Michigan tractor shovel.

There are five basic components in the air-control system: the compressed air supply; the control box and levers; the air control valves; air distribution system; and the clutch actuating mechanism.

A small, 7¼ cubic-inch compressor, mounted with the excavator-crane engine and operated by a V-belt, supplies all air needs for the machine. Air at 120 psi is supplied to an air storage tank and distributed to and from the control valves and clutches by means of standard copper tubing.

Controls are centrally located in a small control box located for the operator's convenience. Levers project out of the box about six inches and are topped with a round knob for easy gripping. A lever is moved forward to actuate an attachment in one direction, and backward to reverse the direction. The total number of levers on a particular machine depends on specific attachments and operations performed.

The heart of the system is the air control valve, which acts essentially as an air metering device. This enables the operator to apply controlled pressure which varies with the distance of movement of the lever. It consists basically of two opposed-acting valves; a high pressure and a bypass valve. Spring loading and a flexible diaphragm separating the high pressure from the bypass side, permit the outlet pressure to vary from zero to the maximum 120 psi as the lever is moved. Until the lever is moved the full distance, the operator is effectively slipping the clutch.

The control valves are inexpensive, have few moving parts and can be disassembled and re-assembled in a matter of minutes without special tools.

HYDRAULIC CONTROL SYSTEM

The tractor shovel is a case where a hydraulic system is the more feasible. Service conditions are extremely rugged. The hydraulic components make

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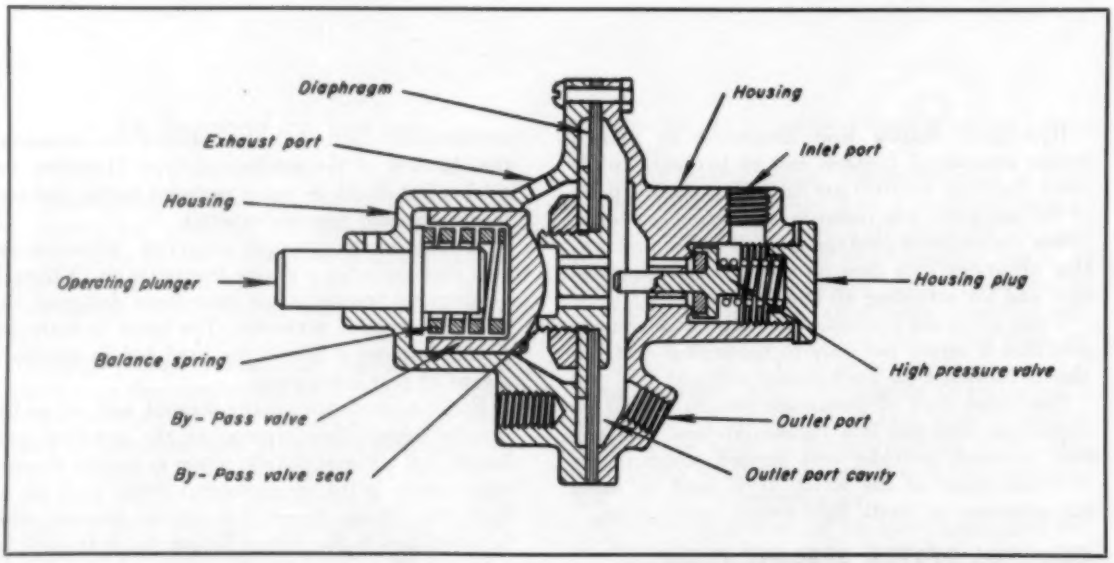
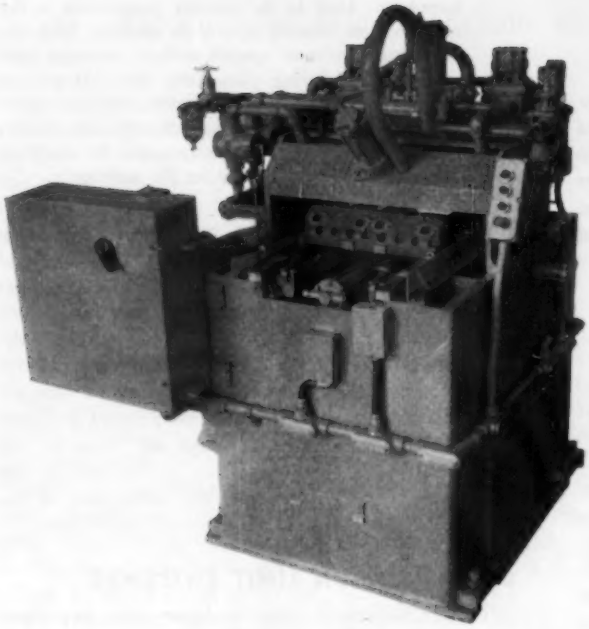


AIR VALVE for controlling the air operated clutch system on the excavator-crane has two main sections separated by a diaphragm. The valve is shown in its release position, with the exhaust valve open and the inlet or high pressure valve closed. Pressure applied by the operator on the operating plunger acts to compress the balance spring. The by-pass valve contacts the by-pass valve seat mounted in the diaphragm to close off the exhaust. Further pressure causes the flat side of the by-pass valve seat to contact the high pressure valve stem, pushing the valve from its seat so that air pressure in the tank and the inlet port cavity is permitted to pass through the holes in the high pressure valve seat and into the outlet port cavity, and then out through tubing to the clutch ram.



Do you know your electrical controls for air powered circuits? Here's a relatively simple piece of production equipment having an electrical control circuit which includes all the basic control elements. Since most complex designs are merely a pyramiding of simpler sections, developing the circuit for this cylinder head flushing machine requires as much know-how as any large system having hundreds of elements.

ELECTRICAL CONTROL ELEMENTS

. . . in an air powered flushing machine

Limit Switches

Push Buttons

Control Relays

Timers

Pressure Switches

FLEXIBLE control of a machine cycle and assurance that the set cycle will repeat accurately and safely must be provided by the electrical elements which actuate control valves.

Typical of the air powered machines on which there is little question that control must be provided electrically is the transfer type flushing machine built by Standard Machine & Tool Co., Ltd., Windsor. This machine becomes part of the equipment in a production line for automotive cylinder heads. Therefore, proper speed and reliability, to coordinate this operation with machines ahead and behind, must be assured.

Purpose of the machine is to flush out chips and dirt from chambers of the cylinder head. The base of this welded steel machine supports a bridge which carries air cylinder operated adapter plates to which

are attached water connections for flushing the various chambers. A motor driven water pump delivers the proper amount of water from a reservoir in the base of the machine. Chips are trapped by a wire screen, and sludge settles at the bottom of the base. A transfer bar mechanism moves the cylinder head along when the flushing cycle has been completed.

LIGHT WORK LOADS

Selection of air power for the seven cylinder powered operations is a logical choice considering the loads involved and the simplicity of the air circuit as compared to any mechanical or hydraulic devices. Compressed air is used to power pins which locate the work, to power the work clamps, to actuate the water control valves, and also to drive the transfer cylinder.

Sequencing of these operations is performed with a combination of electrical and air sequencing devices. Establishing a rough machine sequence is relatively simple. Here's the thinking on that:

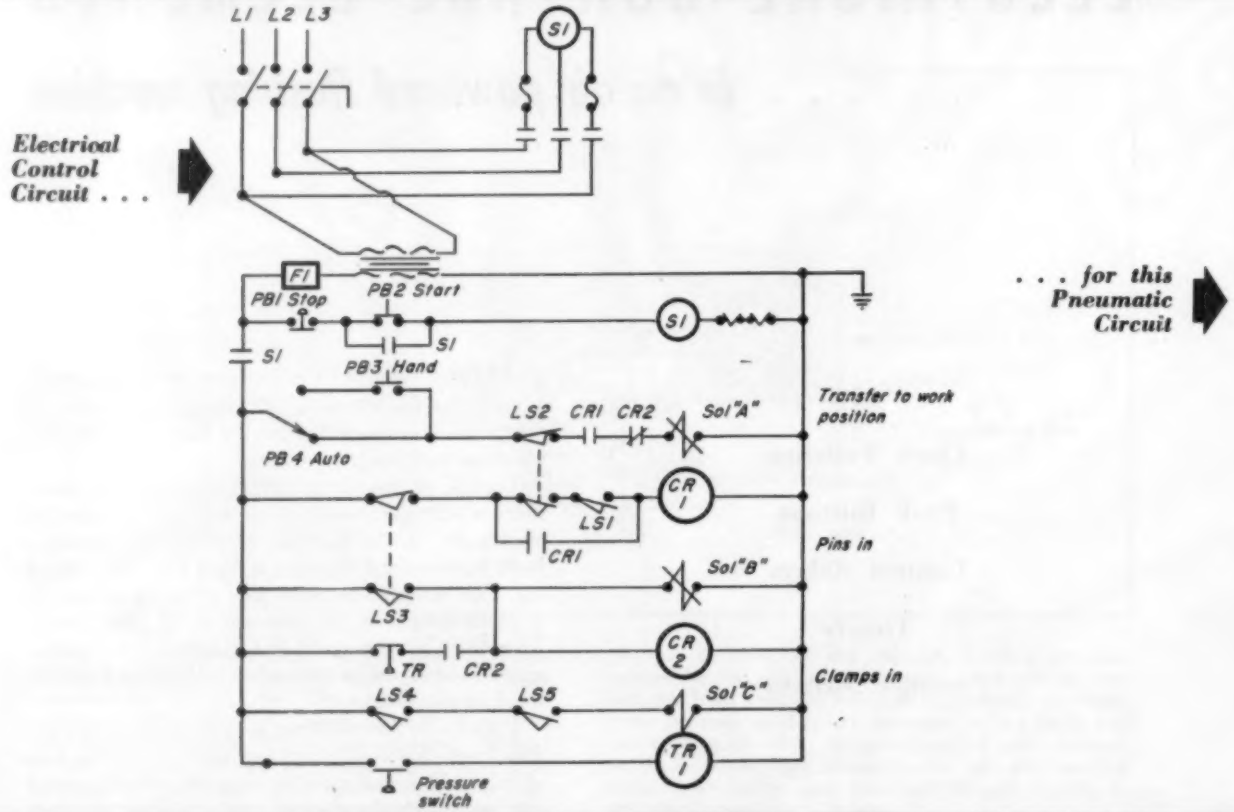
> With the water pump running continuously, a loaded part must be transferred to the work position and a flushed part in the work position must be transferred out. Then as the transfer moves back to the load position, locating pins must move in. With the pins in, clamps must operate without removing pressure on the locating pins. Only after clamps are positively set, are the flushing valves operated. After the proper flushing time has elapsed, the clamps must retract, then the pins retract, and the electrical circuit is deenergized ready for the next cycle.

How these operations are performed is clearly shown in the electrical schematic and the graphical pneumatic circuit.

One single solenoid operated two position, 4-way valve controls the transfer cylinder. A second identical valve, working with a solenoid operated 2-way valve, controls the clamp and pin cylinders. One air sequence valve is in the circuit to prevent pressure drop on the pin cylinders when air flows to the clamp cylinders. Two sequence valves are in the circuit to properly sequence the retraction of the clamp and pin cylinders in respect to each other.

USES PRECISION LIMIT SWITCHES

This 110v control circuit includes every important type of electrical element. The water pump motor is started and stopped by pushbuttons and control relay S_1 which provides the necessary interlocks. A selector switch is installed to permit continuous automatic cycling or a single automatic cycle.



"Coordinate this operation with the production line"

Electrical sequencing is controlled by five limit switches, a pressure switch and a timer. All five limit switches are small precision units which measure about 2½ by 3½ by 1½ inches. Each has a one way roller arm. Each switch has one normally closed pole and one normally open pole. Only the normally open pole of three of the switches is used. On LS-2 and LS-3, both poles are wired into the circuit.

20 SECOND FLUSHING CYCLE

The pneumatic timing relay used in this circuit to control the flushing cycle is of the on-delay type. This time delay for the flushing cycle is about 20 seconds and is obtained after the timer operating coil is energized. On this machine, closing of the pressure switch energizes the timer to start timing the flushing cycle. The air pressure operated plunger switch is set to close at 80 psi.

The electrical circuit is greatly simplified by choosing to air-pilot operate the flushing valves. These valves are spring loaded so that they open simultaneously with the operation of the pressure switch which starts the timer cycle.

The pressure switch is of course piped into the air circuit. Limit switches are positioned on the machine to achieve proper tripping action by cylinder travel. Mounted on the electrical control panel are the power disconnect switch, the power transformer, the motor starter and the two control relays. All leads to the limit switches and pressure switch are tied into a terminal strip on the panel.

Operating at 80% efficiency, this machine cycle provides a production rate of about 130 cylinder heads per hour. ▼▼▼

Recent articles on Electrical Control

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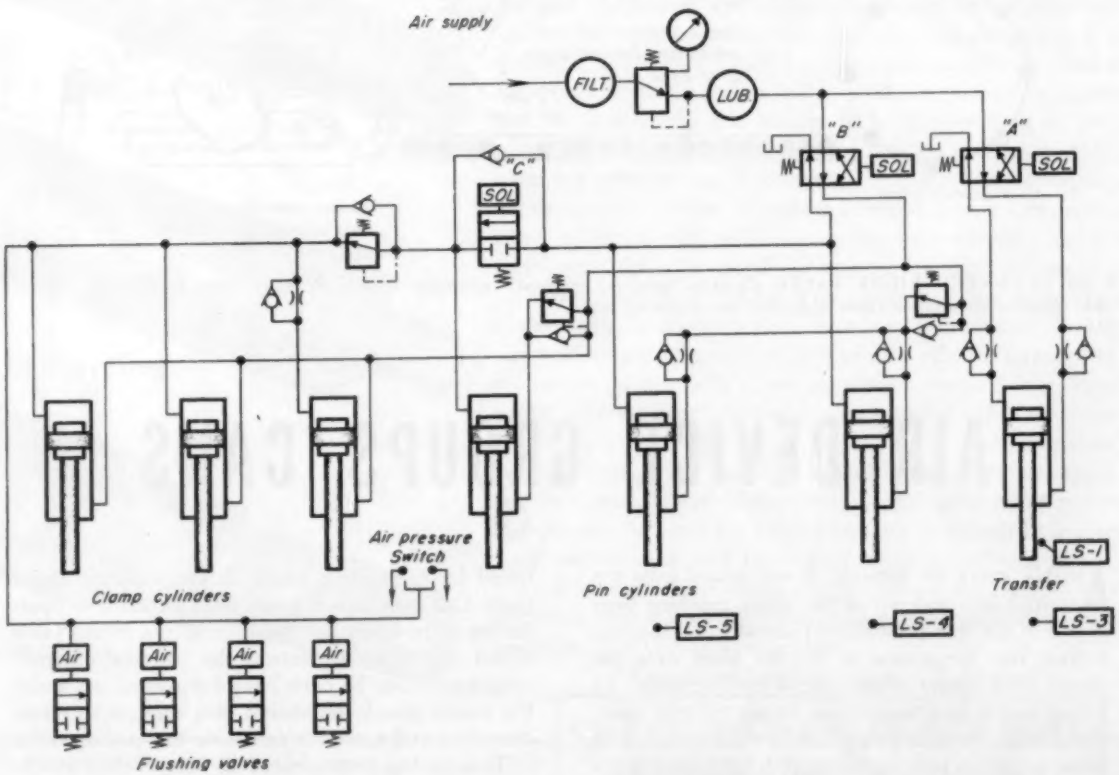
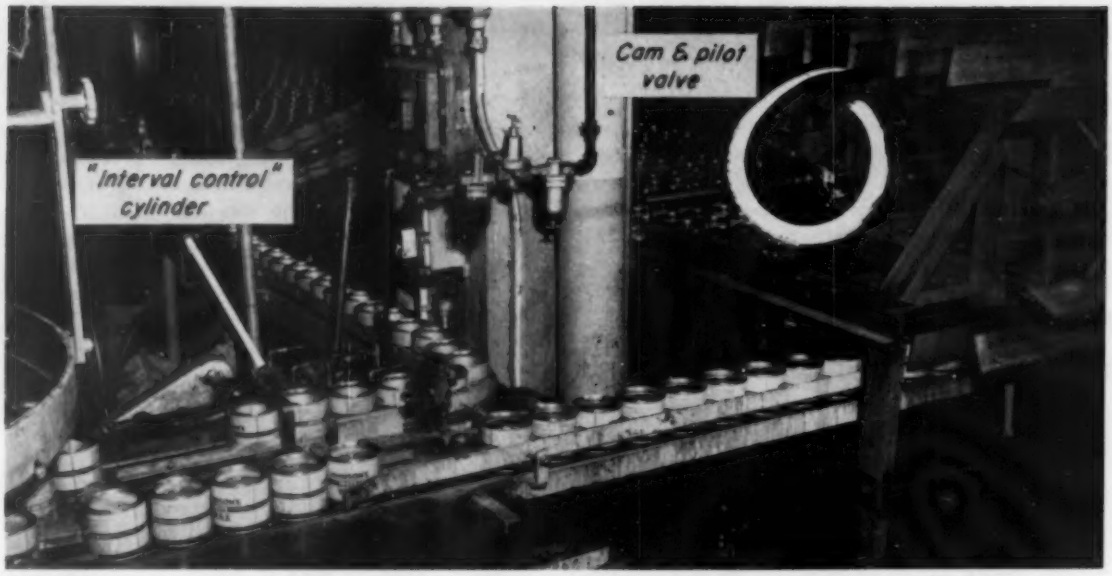
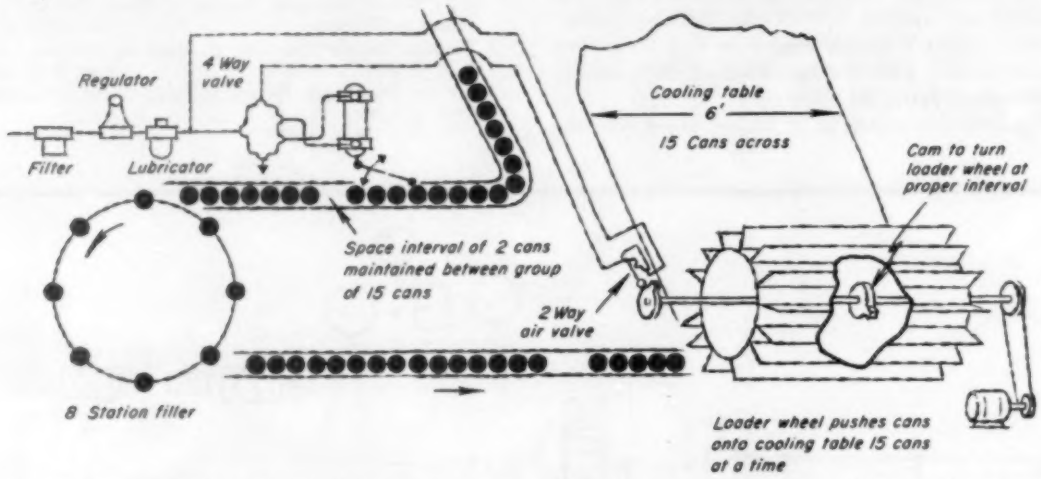




ADDITION of air power for timing of the cans in this line requires a minimum number of parts.


Regulator
4 Way valve
Filter
Lubricator
Cooling table 6'
15 Cans across
Cam to turn loader wheel at proper interval
Space interval of 2 cans maintained between group of 15 cans
2 Way air valve
8 Station filler
Loader wheel pushes cans onto cooling table 15 cans at a time

CAM OPERATED PILOT VALVE signals "interval control" cylinder to divide cans into groups of 15 as they are fed through a filler and over to a cooling table.

AIR DEVICE GROUPS CANS

ABOUT every six seconds, 8 one pound cans are moved into and out of the filling machine used in one of the wax production lines at S. C. Johnson & Son, Inc. In groups of 15, the filled cans are placed by a loader wheel onto a cooling table. To keep the cans in groups of 15, an air cylinder operates intermittently to stop the flow of empty cans being screw fed into the filling unit. Operation of the air cylinder and the rotation of the loader wheel is timed by cams on a motor driven constant speed shaft. One cam trips a 2-way pilot air valve to operate the main 4-way, two position spring return valve which directs air pressure to the "interval control" cylinder. When 15 cans have been lined up under the loader wheel, the second cam engages to rotate the wheel and move the cans onto the cooling table.

This timing arrangement is inexpensive, simple and flexible. ▼▼▼

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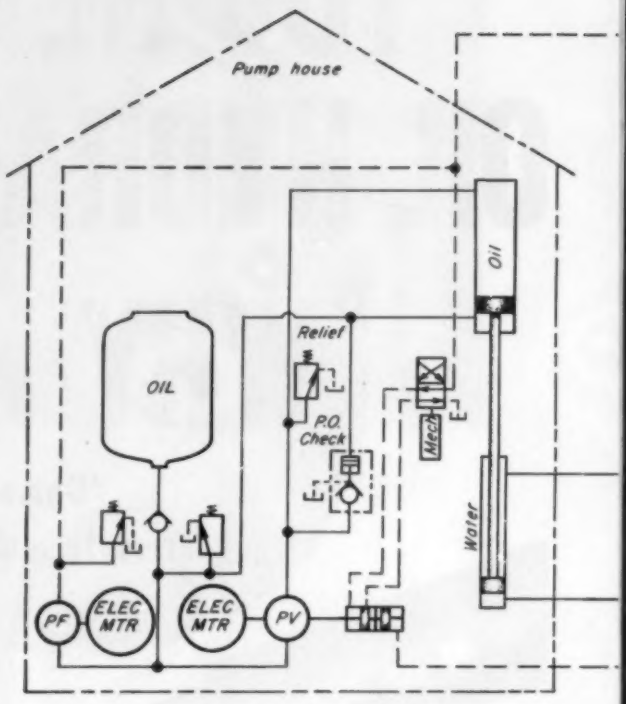
OIL DRIVEN WATER SYSTEM

for forge shop presses

Reduced maintenance and greater safety are the results of this unusual hydraulic circuitry for water powered forging presses.



• By S. J. Killa

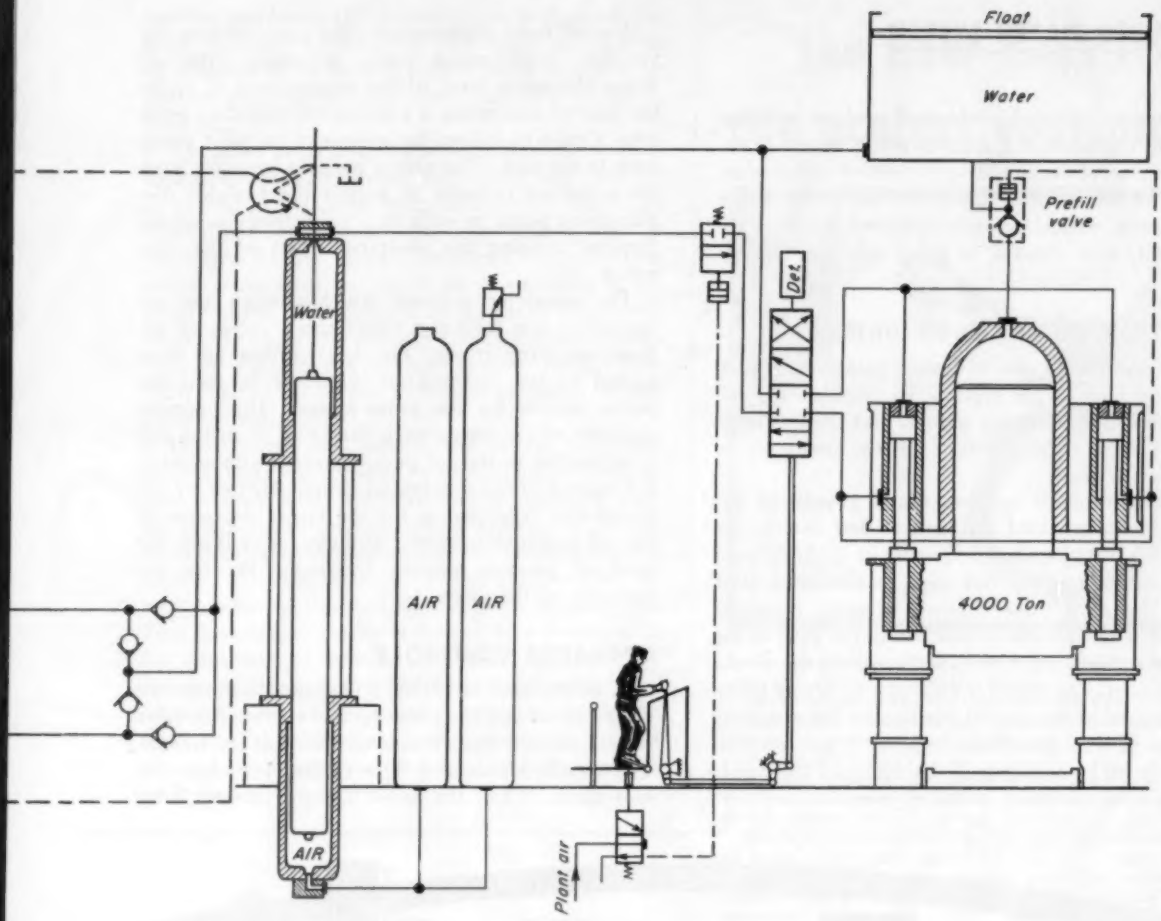
DEVELOPMENT of this fluid power circuit for hot working of metal was carried out at the Landish Co. to eliminate hazardous conditions which could endanger men and materials. The presence of hot metal and proximity of furnaces makes necessary the use of water or a synthetic fire resistant fluid. Because some press circuits embody accumulators with the resultant large volumes of pressurized fluid and because the possibility of leakage or escapement cannot be ignored, water is selected as the working fluid.

If through some failure of men or material, a fire should occur, water used as the hydraulic fluid could extinguish the fire. From an elevation of over 30 feet, and at a pressure of 2500 psi, a spray or deluge of water is an extremely effective fire fighter. Economically, water does not present the clean-up problem that fire-resistant fluids do. Circuits having a gravity prefill require a reasonably large hydraulic reservoir of fluid located on top of the press. The maintenance of large diameter ram packings takes on significant importance when holding back large reservoirs full of costly fluid, rather than water. There have been instances where large quantities of costly fluid have been lost due to failure of ram packings.

As part of the development work, a study of equip-

S. J. KILLA, *Hydraulic Engineer, Ladish Co., Cudahy, Wisconsin.*

"Oil powered converter is a new component in this system"



LAYOUT OF THE FORGING PRESS HYDRAULIC SYSTEM The prefill valves are supplied with water from the press reservoir for rapid closing of the press. High pressure water is supplied to the press from the air powered accumulator. The accumulator is charged with water from the press reservoir by the oil powered converter. The press cylinders exhaust into the press reservoir which also supplies water for the converter.

ment characteristics was made. This study pointed out the advantages and limitations of oil and water power. Based on this study, a composite system using both oil and water was built. Uninterrupted production records of this equipment, which has been in operation for over a year, prove that the choice of components was good.

Component selection and design of the new installation has eliminated several maintenance problems. Formerly, the pump house crew spent much of their time checking the operation of the air-water accumulator. The water pumps also required the attention of the operating crew. The danger of the air escaping from the air-water accumulator and entering the press system has been eliminated. It is obvious that the press control system, which was designed to handle water, would prove very erratic and impossible to control if air got out of the accumulator and into the press.

A 312 gallon accumulator is used to handle the water at 2500 psi. By including a piston in the design of the accumulator, the air content of the water has been effectively reduced. This was done because wire drawing and erosion from cavitation were largely attributed to the presence of air in the water of other press systems employing air-water accumulators of conventional design. A positive mechanical control of the operating level in the accumulator has been achieved by means of a telltale rod attached to the accumulator piston.

Along with the elimination of the air-water contact within the accumulator, a float was incorporated into the reservoir. This float, constructed of sheet metal, entirely blankets the water in the reservoir from the atmosphere to keep it from picking up air. The float also serves as part of a device which is used as an indicator of the water level in the press reservoir. When the press system was filled initially,

the water was filtered, deaerated, and an additive to inhibit oxidation was introduced. It is very gratifying to observe the condition of control valves when preventive maintenance inspections are made. Valve components, which formerly required frequent replacement, now remain in good condition indefinitely.

SELECTION OF THE PUMP UNITS

The converter, a new hydraulic component, is an important part of the system. To combine the advantages of oil hydraulic pumps, and the desirable features of water as the fluid, it was necessary to build a converter.

The converter is constructed of a pair of hydraulic cylinders held rod end to rod end by tie rods. The piston ends are joined in a cross head which supports a trip rod used to actuate a pilot valve. The pilot valve controls a pump actuating cylinder. This cylinder is attached to the yoke of the variable volume oil hydraulic pump which is the prime mover. The pump is used as a reversing pump and centered in the neutral position by the actuating cylinder. A very smooth decompression and reversal are achieved by the controlled shifting of the pump, although the circuit is extremely simple.

A small fixed displacement pilot pump powers the variable displacement pump actuating cylinder. When the water level in the accumulator is up to the desired maximum, a mechanical operating lever trips a valve to unload the volume of the pilot pump back to the tank. This action removes pressure from the actuating cylinder to permit the variable displacement pump to shift to a no delivery position, thereby stopping the pumping action of the converter.

The converter cylinder which charges the accumulator has inlet and outlet check valves of appropriate proportions. The inlet valves are connected to the accumulator which is in turn the power source for the press system. The opposite cylinder of the converter is larger in diameter and is connected to the oil pump directly with valving for control of the differential volume created by the piston rod. The reason for the larger diameter of the oil powered converter cylinder is to lower the working pressure thereby increasing the life expectancy of the pump.

OPERATOR CONTROLS

A safety shut-off valve is installed between the accumulator and the press control valves. The valve is air operated from a control placed at the treadle. The treadle serves as a floor in the operator's control stand. When the press operator steps off the

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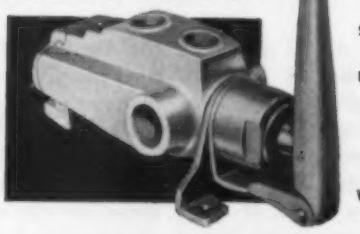

MATERIAL:
Die Cast Aluminum alloy body. Hardened steel valve spool.
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To 12 gpm. Built-in pressure relief, factory set at 1000 psi.
OIL PORTS:
⅜" NPF inlet and return. ½" NPF cylinder ports.
MOUNTING:
3 points with ¼" bolts. Any position for operator's convenience. Reversible mounting foot. 360° handle positioning.
SYSTEMS:
Convertible to control single or double acting systems.
FEATURE:
HOLDKONTROL returns valve to neutral position when cylinder reaches end of stroke. Adjustment eliminates HOLDKONTROL if desired. Spring return to center. ¼" lands seal cylinder ports in center position.
WEIGHT:
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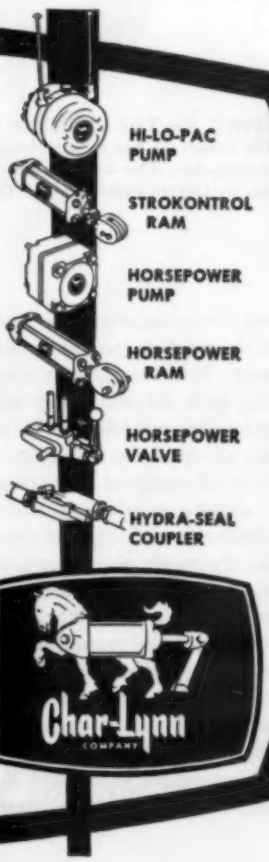

The Char-Lynn Holdkontrol Valve is a general purpose valve for agricultural and industrial applications. It offers a combination of many features —all of which have never before been offered in a single valve. Built-in **HOLDKONTROL**. This frees the operator from holding the valve in an operating position. The valve can be returned manually to neutral, or it will return by itself when the pressure exceeds the relief valve setting. Modern industrial design . . . Envelope completely encloses and protects functional parts. Built to withstand surge pressures above 5000 psi.

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treadle, and leaves the press controls unattended, the safety shut-off valve closes. Accidental application of pressure to the press system without direction by the operator is thereby prevented and safety is insured.

The main press directional control lever, in addition to the pressure gages, indicators, and switches is located at the press operator's control stand. By means of a servo system the main control lever is connected to the main directional control valve, which is installed on top of the press, close to the prefill valves. The location of the main directional control valve in this manner effectively reduces the amount of piping and resultant pressure drop, which contributes to a higher hydraulic efficiency of the press system.

The oil reservoir, pumps, converters, and complete oil circuit are housed in a non-flammable structure at floor level. The structure is equipped with an automatic fire extinguishing system. All motor control equipment is located at the press operator's station. This simplification of control has raised the safety factor of this and similar press installations. This installation combines hazard free design with the minimum of maintenance. The elimination of excess air in the water has contributed in a large measure to the reduction of maintenance while the water itself has eliminated the fire hazard. The oil drive of the converters has helped to make possible maintenance free operation. ▼▼▼

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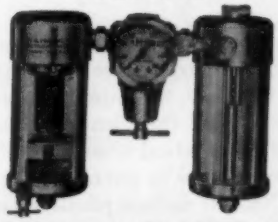

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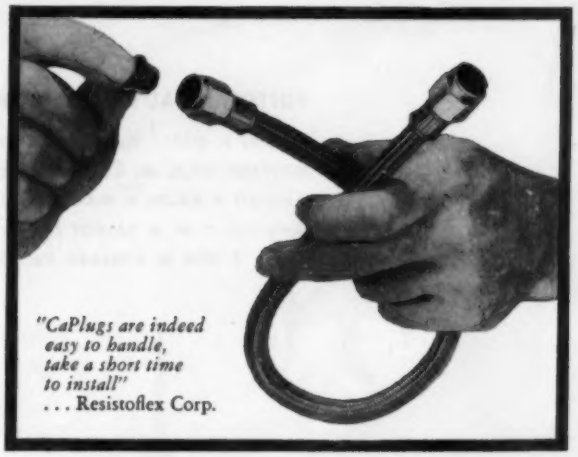

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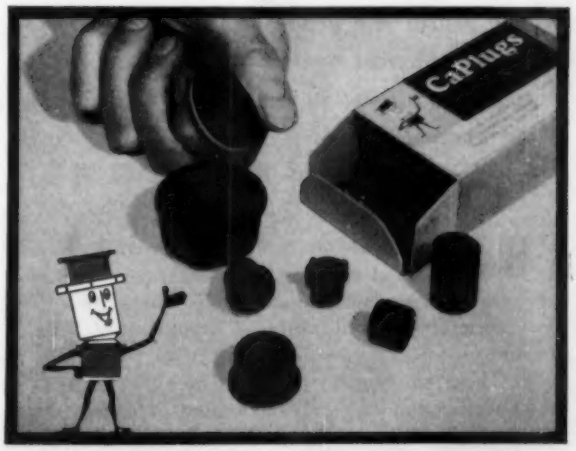

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PRACTICAL PRESSURE.....3000 PSI

for aircraft hydraulic systems

• By Conrad H. Cooke

Electro-Mechanical Department
The Glenn L. Martin Company*

After a very comprehensive study, 4000 psi proved to be the theoretical optimum pressure for aircraft hydraulics. However, the study also proves that at the present time 3000 psi is the practical operating level. This article tells how the optimum 4000 psi pressure was determined and why 3000 psi systems will continue to be used.

HOW long should we continue to design hydraulic systems and components to 3000 psi? Theoretically *what is* the *optimum* system pressure? Is it practical? What measure of improvement does it offer?

These are primary questions facing engineers responsible for long range planning of research and development programs at WADC and BuAer—also facing system designers of advanced aircraft and component designers who are continually forging ahead with new developments.

Reliable answers to these questions are not readily available because of the many changing factors involved. Yet, *answers we must* have! In recognition of this need, the Aircraft Laboratory at WADC contracted with the Glenn L. Martin Company to conduct a theoretical investigation of optimum pressure or pressures in aircraft hydraulic systems. The study** was to include pilotless and piloted aircraft, as well as helicopters.

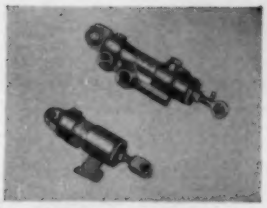
Optimum pressure is defined as that system pressure which results in the most ideal combination of design factors, considered in their relative degree

*Mr. Cooke was assisted by Eugene Gessner and Robert L. Smith.

**"*Theoretical Investigation of Optimum Pressures in Aircraft Hydraulic Systems*", *WADC Technical Report* 54-189.

LOUD...

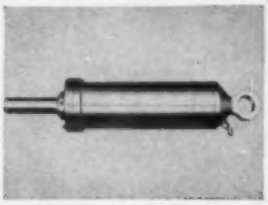
primary source of actuating cylinders on the West Coast



Gun Purge Door Cylinder – 3000 psi, 3/4" bore x 2-1/2" stroke

Door Latch Cylinder – 3000 psi, 1-1/16" bore x 1" stroke

Armament Displacing Cylinder 1500 psi air cylinder 2" bore x 8-1/4" stroke



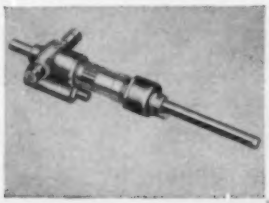
M.L.G. Actuating Cylinder – 3000 psi, 6" bore x 17-1/2" stroke

When a manufacturer gains the reputation of being a primary source for any product, it is usually indicative that they have the "know how" and facilities to produce at competitive prices.

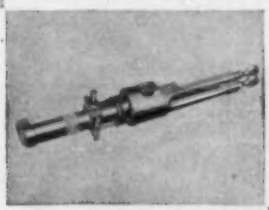
The ability to produce the smallest to the largest, the simplest to the most complex cylinders has made Loud top source for high quality – low priced units.

In addition to making the ordinary actuating cylinder, Loud produces units containing integral mechanical locking devices, snubbing cylinders, power control booster cylinders, as well as a patented mechanically locking cylinder adaptable to many applications where the load is required to be firmly held without pressure and yet easily unlatched and moved hydraulically or pneumatically.

Aileron Booster Cylinder – 1500 psi, 1-9/16" bore x 6-1/8" stroke

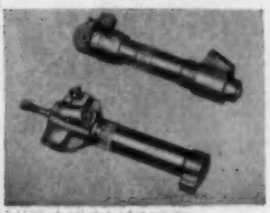


Powerplant Door Cylinder – 1000 psi air cylinder 1-1/4" bore x 8-1/2" stroke w/mech. locks at both ends of stroke



Nose Gear Door Cylinder – 3000 psi, 1-3/16" bore x 7" stroke

Nose Wheel Steering Cylinder – 3000 psi, 1-1/4" bore x 6-3/4" stroke



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of importance and including weight, space and other factors recommended by industry.

Hydraulic system pressures used in airplanes built during the past fifteen years have steadily increased from 800 psi, current in 1939, to 3000 psi, used in all airplanes designed in 1952 and 1953. During this period the horsepower requirements of the systems have greatly increased, demanding improved design efficiency and indicating the need for high pressure. Because the 3000 psi system is a recognized standard, its use by designers is almost universal.

A survey of the aircraft industry was made to define the factors and the hydraulic systems to be used as a basis of analysis. Personal interviews were arranged so that information on the most acute problems involving other possible operating pressures was obtained directly.

To obtain the development and production status of high pressure components and the adaptability of 3000 psi units to higher pressures, questionnaires were sent to leading hydraulic equipment manufacturers. The range of pressures studied was from 1500 psi to 10,000 psi.

GENERAL METHOD OF ANALYSIS

The problem was examined to determine the factors which must be considered, the relative importance of each factor and a method of including each factor in the study.

The factors considered were weight, space, cost, reliability, performance and heat. The aircraft companies surveyed were in general agreement on this order of importance.

The total system weight is the factor of primary importance; all other factors were evaluated independently and then correlated with total system weight.

A detail analysis for both weight and space was made of the components of a hydraulic system of any aircraft. Independent analyses were made of cylinders, pumps, valves, system plumbing, filters, accumulators and reservoirs. Since hydraulic cylinders make up a large proportion of the system, they were analyzed in considerable detail. Three types of system plumbing, for example, were analyzed—pressure lines, return lines and pump supply lines. Each type was then broken up into elements: fluid, tubing and fittings.

SYSTEM ANALYSIS

Having analyzed the individual hydraulic components, the relative proportions of these elements in a system were then established so that results may be integrated. From the aircraft company survey six different systems and two additional variations were established. The most important of these were:

(1) A small flight control system, typical in pilotless aircraft, helicopters and small subsonic piloted airplanes, in which the circuit is devoted primarily, or entirely, to flight control actuators;

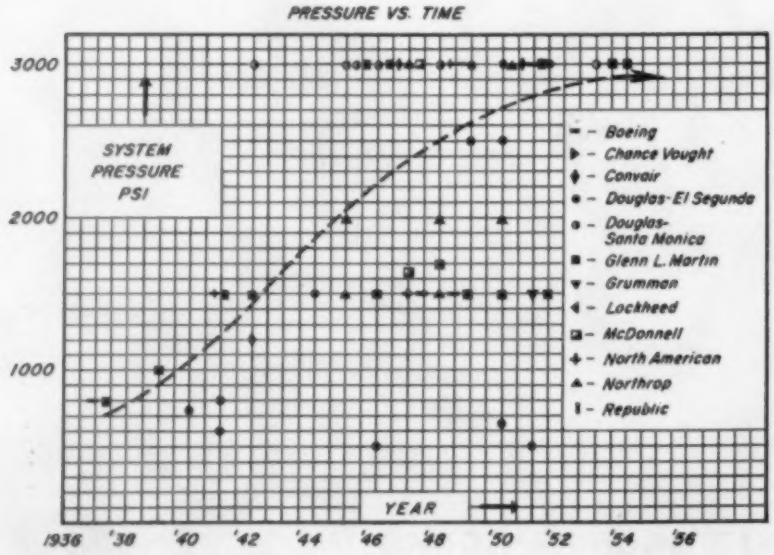
(2) A medium flight control system, to represent the type usually applied to transonic piloted aircraft in the weight class of interceptors or flight bombers; and

(3) A large flight control system, assumed to typify a central type system and proportioned to a large high speed airplane such as a strategic bomber.

These eight systems span the entire range of physical dimensions, horsepower requirements and degree of complication, as defined by the survey.

IMPORTANCE OF WEIGHT AND SPACE

Each pound of weight in the hydraulic system requires the existence of 3 to 15 pounds of indirect



HISTORY OF SYSTEM PRESSURE VS. TIME. Each point represents a new hydraulic system of a military or commercial aircraft. Groupings, first of 1500 psi systems, then of 3000 psi systems, illustrate degree of standardization accomplished through the industry, chiefly as a result of the efforts of the Armed Services.

Pneumatics saves you weight to start with, using air itself as a medium! *More* pounds are saved by the smaller lines used in pneumatic systems — and no *return* lines are required!

Even the heart of a pneumatic system is light — the new Kidde 4-D compressor, for instance, delivers 4 cfm of air compressed to 3000 psi at sea level — yet weighs only 11¼ pounds!

With pneumatics, you can build up a high-pressure, high-horsepower punch, using this low-horsepower, lightweight source. Just *store* the air-power until you need it — even using landing gear struts and other parts of the aircraft itself!

Since viscosity of the air used in pneumatic systems remains essentially the same over a broad temperature range (−65° to +250°), you *always* get fast, dependable power delivery. Pneumatic systems are *never* sluggish!

With pneumatics, leakage is no serious problem. The air supply is always available, and the compressor compensates for any minor leaks which might occur. And since the air used in the system cannot burn, there is no danger from fire!

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weight in the airplane (on the basis of constant airplane performance). Thus, in a modern military airplane where the combination of high aerodynamic forces and reliability requirements demand hydraulic systems having average direct weights of 1 percent gross weight, the hydraulic systems actually are responsible for the existence of 3 to 15 percent of the gross weight of the airplane. It is this major effect of the hydraulic system on the over-all efficiency of the airplane that makes weight the most important of all factors in determining the optimum hydraulic system pressure.

The trend toward higher density aircraft for efficient aerodynamic performance at high subsonic and supersonic speeds has brought about an increasing number of space problems throughout the aircraft. This trend will undoubtedly continue and the need for compact aircraft equipment and systems will always exist.

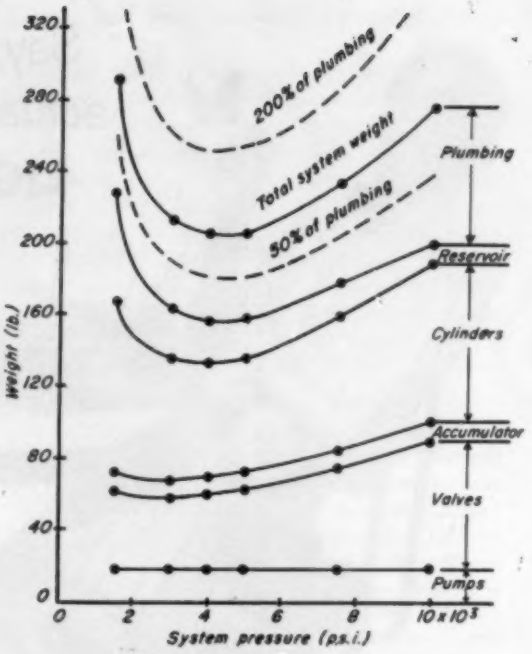
Space problems have occurred to various degrees in the design of aircraft hydraulic systems. The industry survey revealed that the most acute space problem occurs at the installation of hydraulic cylinders for actuation of surface controls within thin wing sections. The problem starts with the mechanism: in providing sufficient moment arms to keep deflections, lost motion and bearing loads within reason. The actuator must then be applied to this mechanism (or moment arm). It must be closely coupled to the control surface, keeping the outside diameter within contours, keeping the length within the length of the compartment available, and leaving enough space around the actuator for associated equipment, such as the control valve, control and followup mechanism, hydraulic plumbing and any special servo-mechanism accessories.

CONSIDERING RELIABILITY

When it can be evaluated, reliability is a primary factor to be considered in making any basic decision. Throughout the study, the concept of reliability was incorporated by considering it necessary to maintain an equivalent degree of it in components and system designs analyzed throughout the pressure range. On this basis the factor of reliability is relatively constant in determination of optimum pressure.

SERVO DESIGNS

Because of the low inertia and compact design features offered, hydraulically powered servo-mechanisms have found extensive use in aircraft. These are used exclusively for pilot airplane surface controls and nose wheel steering, and in the majority of missile surface controls. Hydraulic servos are finding increasing numbers of application in turrets, antennas, and power stabilized devices. In the majority of these cases, the angular travel or the mechanical arrangement permits the use of a simple hydraulic cylinder.



A SYSTEM WEIGHT BREAKDOWN of the medium system is plotted against pressure to illustrate relative proportions and the effect of each component upon the optimum pressure. Valves and cylinders have similar characteristics, tending to produce a slightly lower optimum pressure—an effect compensated for by the reservoir weight. The same optimum pressure occurs in all cases since the characteristics of the total weight of pressure, return and supply lines are similar to that of the total system weight without the lines.

The trends in requirements for supplementary or complete aerodynamic stablization through actuation of surface controls and requirements for tracking at higher speeds have all been in the direction of requiring increased dynamic response of the mechanism. The potential dynamic response of a basically stable servo depends, among other things, directly upon the stiffness of the load-carrying members, such as cylinder, linkage, and back-up structure. Flutter stability of a surface not completely mass-balanced is a function primarily of stiffness of the same members. Reduction of load deflection has been accomplished, to date, by one or more of the following methods:

1. Applying the actuator more directly to the surface or load (through less intermediate linkage).
2. Increasing stiffness of back-up structure and mechanism.
3. Reduction of unit loads by improving mechanical advantage of each element of the mechanism.
4. Increasing stiffness of the actuator.

Methods 3 and 4 are both affected by the level of system pressure. In the cylinder analysis, it was de-

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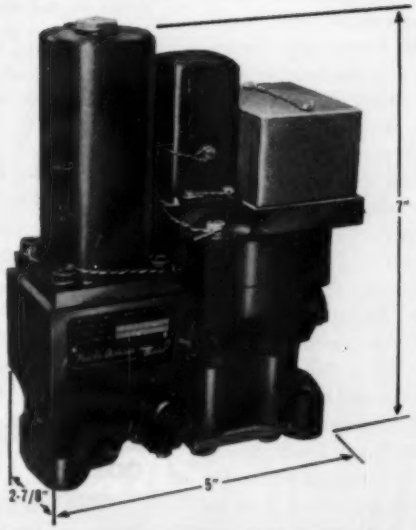

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termined that many cylinders approach the critical column curve at 3000 psi. At higher system pressures these cylinders must operate at shorter strokes and higher loads. As an alternative, special design changes could be made, such as use of through piston rods, internal-area-balancing surfaces, or trunnion-type mounting bearings, each of which results in added weight, space, bearing deflection, costs, or another form of penalty. It is assumed that 30 percent of servo actuators are so affected.

Cylinder stiffness depends directly upon volumetric displacement which varies inversely with working pressure range. Another approach is that piston deflection, in percent of total stroke, is increased as the internal column of fluid is compressed by higher pressures.

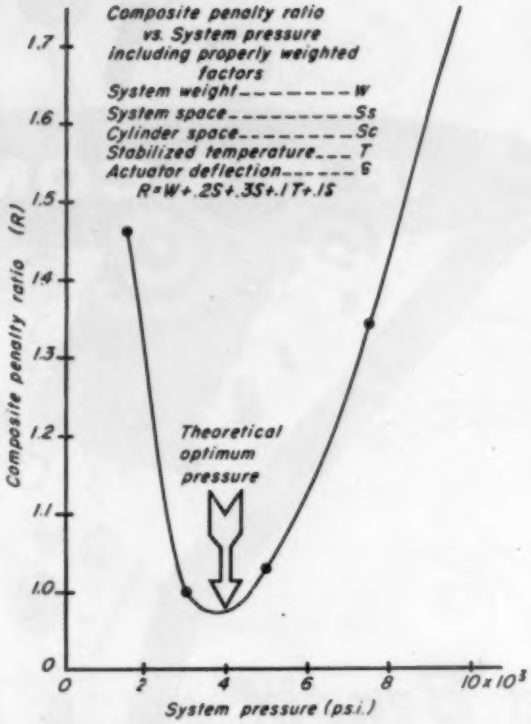
TEMPERATURE CONTROL

The problem of temperature control within hydraulic systems has become increasingly important in recent years for a number of basic reasons.

Compartment temperatures may be expected to stablize after 4 to 5 minutes of high-speed flight at a temperature of 85 to 90 percent of the theoretical ram rise due to skin friction alone. Higher temperatures will occur where internal heat is being generated. As a result of the trend toward airplanes operating in the high subsonic and supersonic speed range, a temperature barrier now exists, and it will continue to exist throughout the foreseeable future. Airplane performance is limited by the temperature at which the basic airframe structural properties are seriously affected. Since the construction of many parts in the hydraulic system are designed primarily to obtain the internal pressure, their weight efficiency is governed by the same properties as in the case of airframe structure. This means that in many future aircraft, the internal fluid temperature, in general, should be no higher than the average compartment temperature. In other aircraft, where there is some margin with respect to airframe temperature barrier, the hydraulic system temperature can be higher than compartment temperatures, but the amount will definitely be limited.

Another trend influencing the heat problem has been the increase in system power requirements for a given size airplane. The heat generated has increased accordingly.

The rapid increase in the use of high-powered hydraulic servo-mechanisms has been an important addition to the sources of heat generated because such devices are continuously in use and because servo valves generate more heat by pressure drop and by leakage than do selector valves. In the heat analysis of a medium main hydraulic system, 39.5% was generated at the pump and 40.5% was generated by the flight control valves.



THE TERM "COMPOSITE PENALTY RATIO" means it is composed of the combined effects of all variables; each variable is expressed in the form of the penalty it imposes upon the aircraft. Numerical values are normalized with unity at 3000 psi, thus representing the ratio of penalty at a given pressure with respect to the penalty at 3000 psi. The curve represents the final results of the theoretical analysis. Being a penalty curve, the optimum is represented by the low point.

A typical, average size system was analyzed to determine the influence of various system pressures on the heat problem. This revealed that a considerable increase in heat generated by the hydraulic system occurs at higher pressures. This is caused by reduced leakage efficiency of pumps and control valves. The reduction of external surface area of lines and components causes the system stablized temperature to rise very rapidly in the higher pressure region.

COST

While recurring costs were considered constant in the choice of an optimum pressure, the economic aspects of a change in the system operating pressure must be considered.

Fixed on non-recurring costs—those involved in the manufacture of standard or proprietary items at the higher pressure, as well as development costs—would represent a very sizable sum. New specifications and design requirements, production tooling, testing would all be necessary.

It is noted that the overall cost of such a pressure

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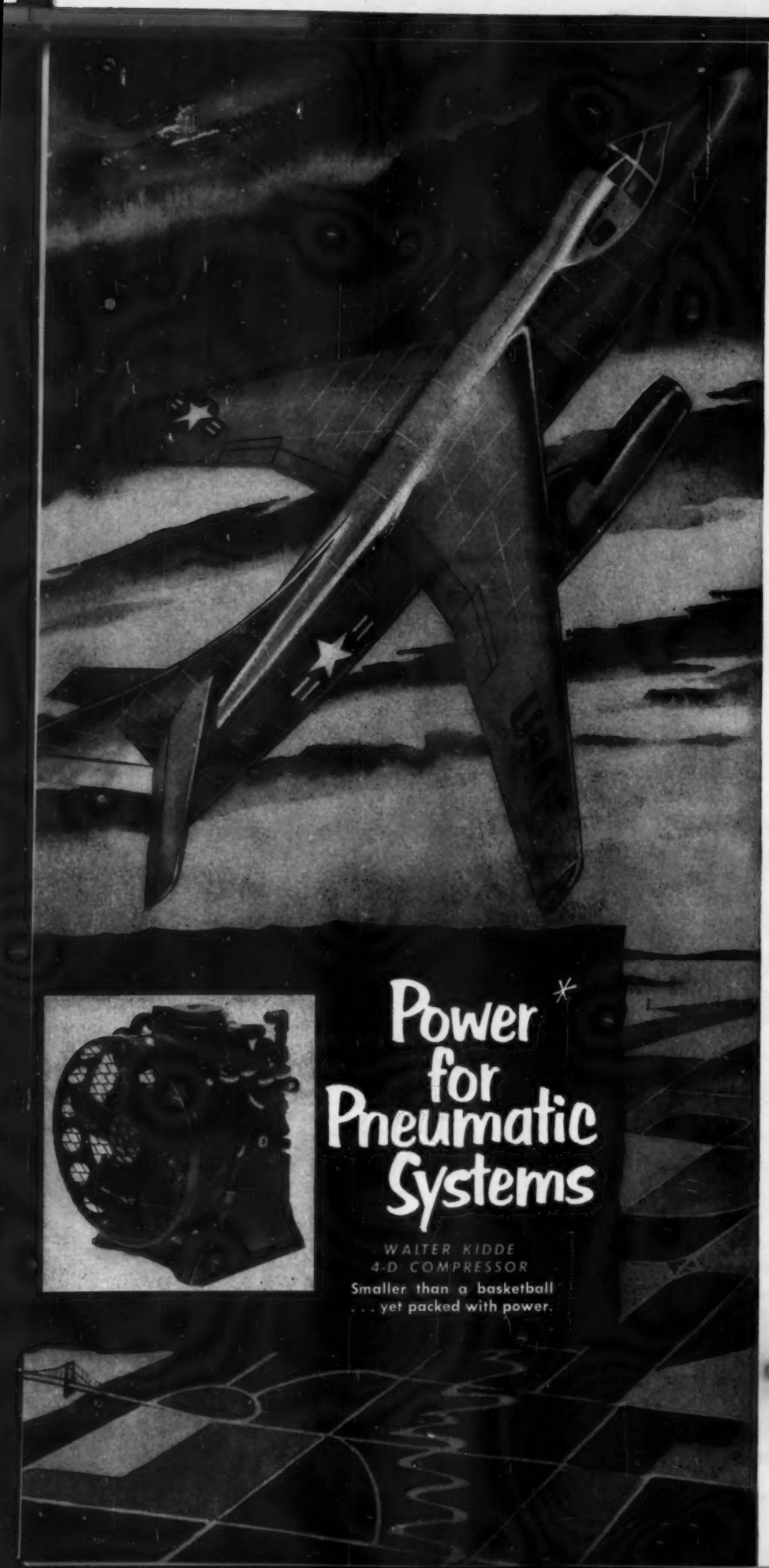

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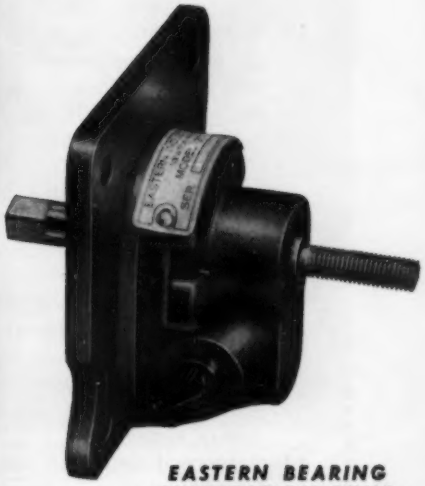

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change would be reduced to a large degree if the change was made concurrent with the development of high temperature components.

CONCLUSIONS

1. Not considering initial costs, the indicated optimum pressure is 4000 psi.
2. The total effective gain in preceeding from 3000 psi to 4000 psi would be an effective system weight saving of 2.46 percent. A breakdown of the saving is as follows:
   (a) Total system weight reduction of 4.4 percent.
   (b) Total system space reduction of 13.8 percent.
   (c) Cylinder space reduction of 10.26 percent.
   (d) Cylinder deflection increase from 33 percent to 44.8 percent.
   (e) Stabilized system temperature (increment above compartment temperature) increase of 33 percent.
3. The theoretical optimum pressure is fairly independent of the type, size and proportions of hydraulic systems.
4. A tremendous initial, non-recurring, cost would be required to make the change from 3000 psi to 4000 psi. This would be necessary for the establishment of new standards, the design and development of new components and test facilities, and the procurement and the initial training associated with the replacement of all the existing test facilities.
5. A temporary loss in reliability will occur in the transition period during the de-bugging of newly developed equipment.
6. In the opinion of the contractor, the small gain of 2.46 percent effective reduction in system weight does not justify the initial cost and temporary loss in reliability which would occur if the standard system pressure were changed to 4000 psi.

RECOMMENDATIONS

It is recommended that the present standard of 3000 psi be held as the upper limit of pressure for production of hydraulic system.

This recommendation was made on the basis of:

(1) The conclusions, which indicate that the potential gain by changing system pressure does not justify the initial cost and temporary loss of reliability.

(2) A change in system pressure in the near future would have to be accomplished concurrently with development of high temperature systems and would extend the period of development, and delay either the achievement of high temperature or high pressure systems.

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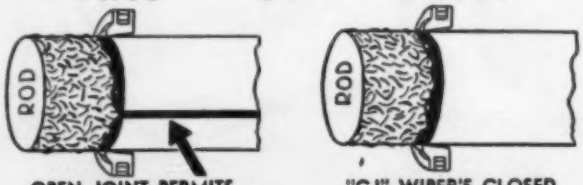

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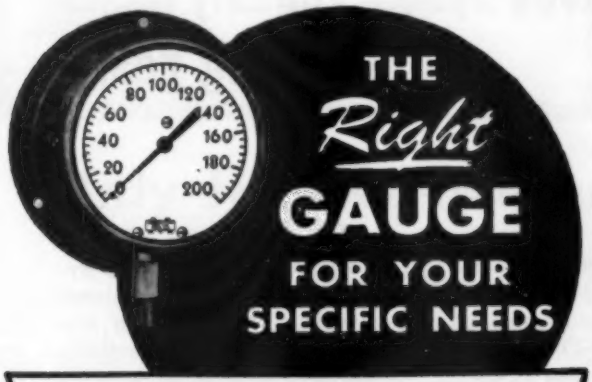
(3) There are potential developments within the field of aircraft hydraulics which are necessary to meet future requirements or which indicate more potential improvement with less expenditure than in the case of changing system pressure. Such developments, listed in order of their importance, are as follows:

(a) Development of fluid, seals, flexible lines, components and systems which will be compatible with a temperature range extended upward progressively, keeping pace with aircraft performance as limited by basic structural and power plant considerations.

(b) Development and maintenance of a reliability program with the ultimate goal of "Engineering for Reliability" by determining economical degree of reliability for each type aircraft, analyzing reliability of each system, specifying reliability requirements for each component with component development where needed, and maintaining control through statistical records.

(c) Use of superior materials in present components.

In summary, the final recommendation is repeated —that the present standard of 3000 psi be held as the upper limit of pressure for production of aircraft hydraulic systems! ▼▼▼



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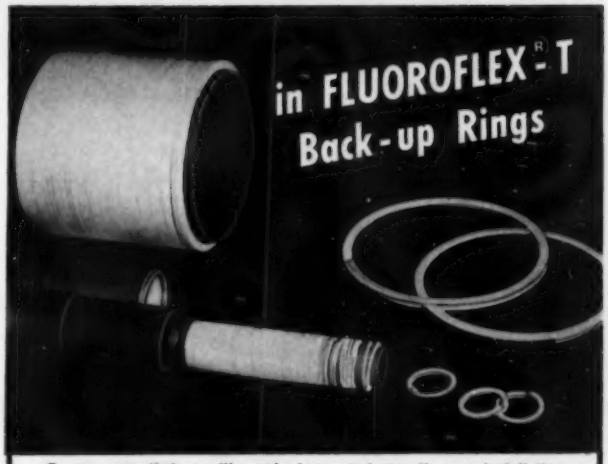

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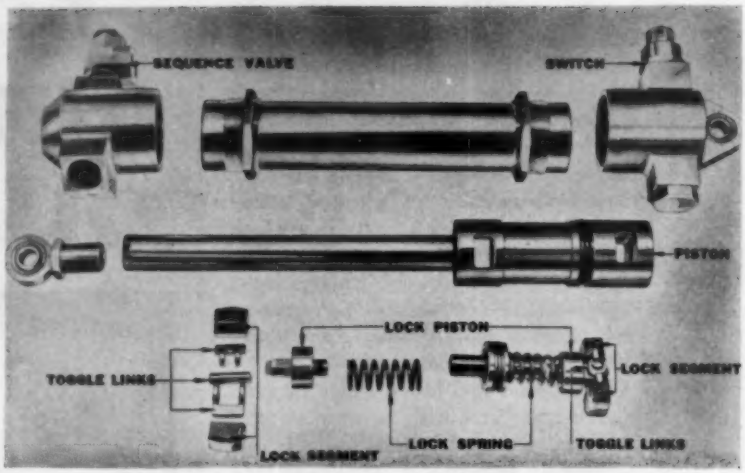

Exploded view of a two segment lock.

Keeping landing gears, wheel doors and bomb doors in a retracted position is no small problem. Most external locking devices are heavy, complicated, troublesome and bulky. A new development, by Boeing, of an internal locking device promises to obsolete cumbersome external locks.

TOGGLE ACTUATOR

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• By Richard A. Chace

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The lock is pressure balanced so a pressure surge from the operation of some other part of the hydraulic system cannot inadvertently unlock the lock. Other features are the ability to manually unlock the actuator in the retracted position and to operate sequence valves and electrical switches' directly from the locking segments.

RICHARD A. CHACE, *Research Engineer, Hydraulics Group, Boeing Airplane Company, Seattle, Washington.*

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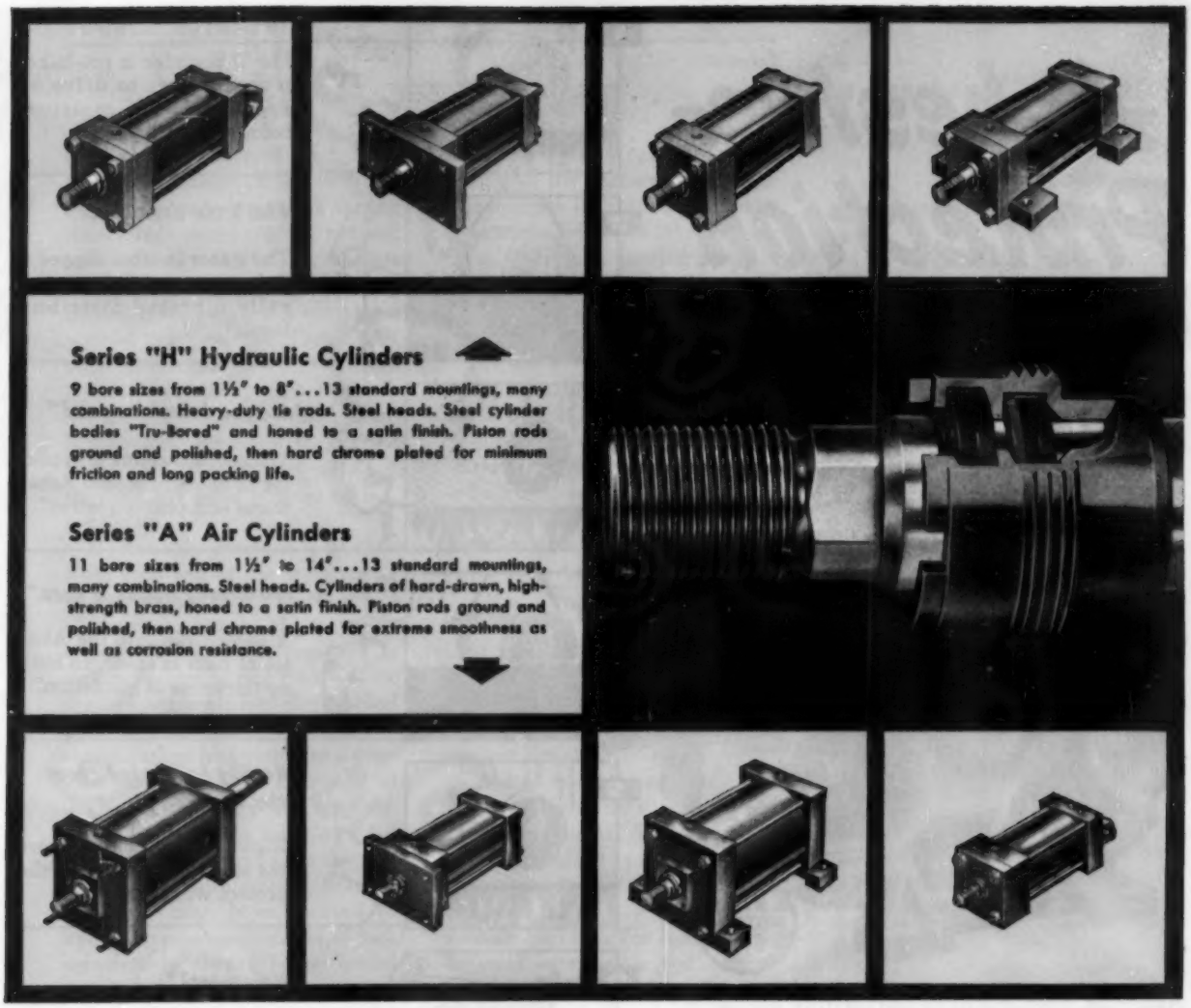
The reason this lock can unlock successfully under high external loads is the toggle linkage. As soon as the toggle linkage is pulled "off center" it cannot support a load and thus there is no highly loaded corner taking the full unlocking load. However, the lock spring enables the collapsed toggles to offer some resistance during unlocking. This resistance, plus the fact that

Continued on page 99



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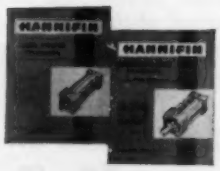

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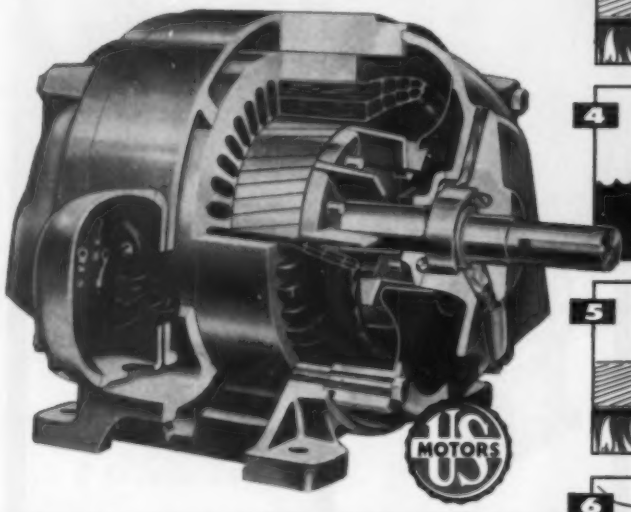

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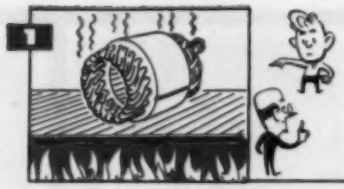

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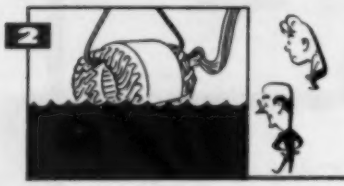
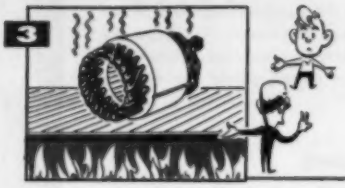


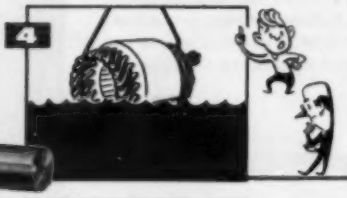
"What's the dunkin' for?"

"The stator is vibro-dipped in Asbestosite; wires electrically vibrated distribute insulation."



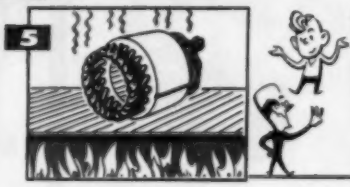
"Are you bakin' it again?"

"The second baking is applied for 12 hours to season Asbestosite and position wires."



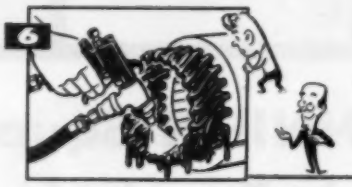
"You already dipped it once."

"A second dip into the Abestosite bath is made, to build up thickness of insulation."



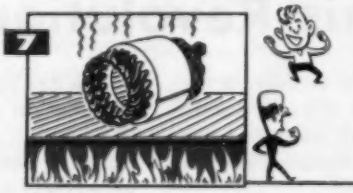
"Nothing half-baked about this, is there?"

"Right! A third baking cures the second coating to further protect windings."



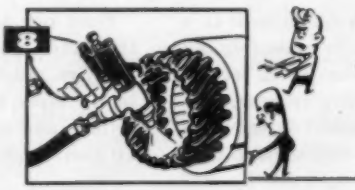
"Now what?"

"Windings are gun-sprayed with Asbestosite to form a smooth surface."



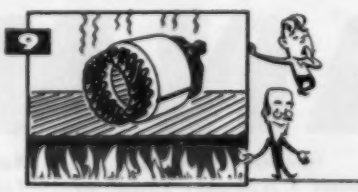
"Here we go again!"

"Yes, further baking for 3 hours hardens the coating to more completely protect windings."



"Here comes the gun again!"

"A final spray of asbestos compound is applied to provide very hard moisture-resistant finish."



"This is where I came in."

"A fifth and final bake of 12 hours insures impervious surface of coil insulation."

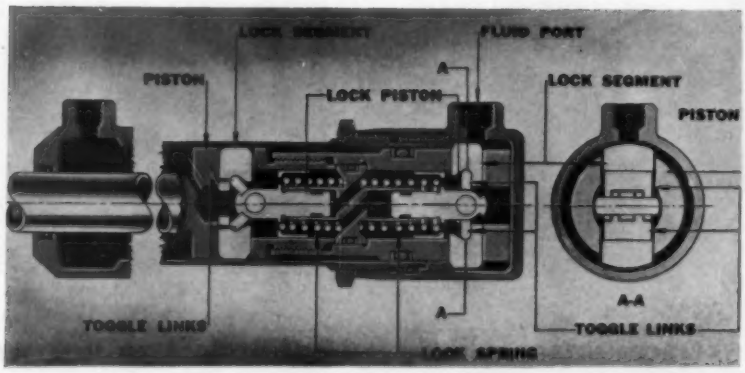
the locking surface of the locking segments changes from complete contact to corner contact during unlocking, caused original nitrided steel lock segments to gall. Chrome plated steel segments and case hardened steel segments were tried without much success. Then 75 ST aluminum segments were tried and lasted for 12,000 cycles before failing in bearing. After that, al-ni-bronze lock segments were tried and went 20,000 cycles without showing any signs of wear or failure.

Hydraulic pressure is ported from each end of the main piston to the lock piston of the other end of the main piston. This provides a positive hydraulic pressure as well as the lock spring load to force the lock segments into their locked position. Also this provides a pressure-balanced lock piston so a pressure surge in some other part of the hydraulic system will not inadvertently unlock the actuator if the control valve is vented to the rest of the hydraulic system. Because the lock piston is subjected to hydraulic pressure, one set of lock segments is always being forced out against the actuator barrel during retraction or extension. This sliding of the segments along the barrel under load did not damage the barrel during 20,000 cycles because of the good bearing material they are made from, the small force of the lock piston, and the geometry of the toggle linkage.

The angle of the engaging surface of the lock segment and the gland of the actuator was very carefully selected to reduce the crushing load going into toggle linkage and still be great enough to provide a force to overcome a coefficient of friction of over .25 in the lock during unlocking.

Limitations In Size

At the present time toggle lock actuators have been designed from 2⅛" diameter minimum to 3½" diameter maximum. Probably the smallest actuator that could use the toggle lock is 1½" diameter; there is no maximum limit. The largest diameter actuator, 3½", tested to date successfully passed a limit load test of 46,000 pounds and withstood 220,000 pounds in the ultimate load test. The locks can be designed as either a rod end of head end lock or both. ▼▼▼



How It Works

This actuator is locked in the retracted position. To unlock the actuator, hydraulic pressure acts on the lock piston moving it toward the rod end. The lock piston is attached to the toggle links and pulls them off center. The hydraulic pressure also acts on the main piston, extending the piston which forces the locking segments to retract into the piston thus unlocking the actuator. The main piston then extends and the locking segments are retained in the unlocked position by the barrel. When the piston is fully extended, the lock spring and the hydraulic pressure act on the lock piston in the other end of the main piston, forcing the toggles "on center" and the locking segments to extend and engage the rod end gland and lock the actuator in the extended position.

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SAE AIRCRAFT COMMITTEES

JUST as this issue of APPLIED HYDRAULICS is going to press, the SAE A-6 committee is meeting in Montreal for three days to discuss hydraulic and pneumatic specifications for aircraft.

The preliminary agenda sent by chairman B. R. Teree lists about 35 specific items for discussion.

Much of the discussion on all items of the meeting will deal with the standardization of dimensional details and nomenclature. Reports on surveys which have been carried out will be given. Agreement on standards which will affect the component manufacturers and aircraft circuit designers and builders will be fully reported in APPLIED HYDRAULICS next month.

New Developments

Among the discussions which may introduce new developments will be a report by R. A. Green on the proposed specs for a fiber glass air bottle.

Developments in high temperature pneumatic applications will include a discussion of pneumatic grease and packings.

Something new might also come out of a decision which the Services have been requested to make on the old problem of marking "O" rings.

On specs for hydraulic fluid, MIL-0-5606, data on tolerable water contamination is requested.

A paper recommending new gland designs for operation at 275 degrees is being presented by Tommy McCuistion.

Operation at 400 degrees is also under discussion — fluids, packings, filters and testing programs.

Leakage Control

"Why are self-locking nuts required on aircraft structural con-

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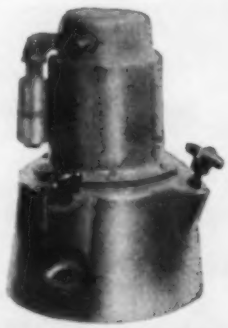

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nections, but not on hydraulic connections?" Since a recent survey indicates that 76% of the leakage troubles are due to loosening of nuts, the discussion of this question may prove significant.

Also that everpresent problem of "what's leakage?" and "what's a wetted surface?" is on the agenda.

Oil Contamination

Precision servo valves are putting new emphasis on filtration of particles down to 2 microns. Magnetic filtration and sintered metallic filter elements are being investigated to improve the degree of filtration.

C. Lovenberg will give a progress report on the study of fluid contamination being carried on at Massachusetts Institute of Technology. ▼▼▼

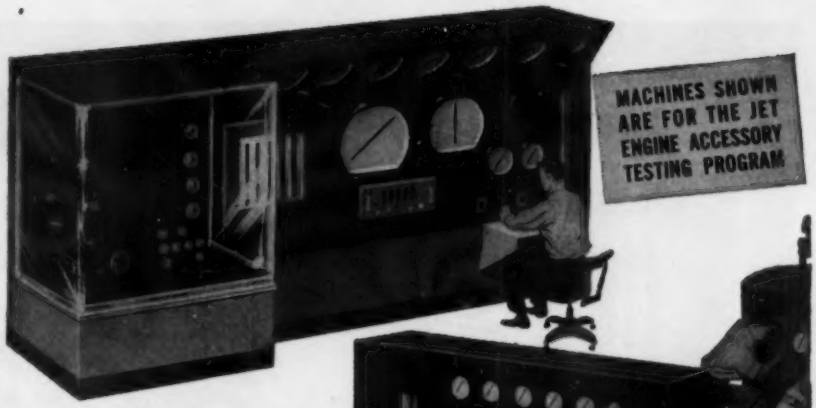
Hydraulic Press Built From Salvaged Aircraft Parts

Pastushin Aviation Corp. developed this 35-ton horn press for piercing and punching a difficult pattern of 12 small holes concentric with a large access hole in jettisonable tank nose skins.

An accumulator type hydraulic system reduces power requirements

from 9 hp to 3½ hp. A pump supplies 1½ gpm to the circuit. The hydraulic cylinder is a modified aircraft landing gear cylinder and the loading valves are aircraft-type coupled to a four-way control valve solenoid-operated from limit switches.

Previously this operation would require 8 or 10 minutes, not including burring. This new press does the same job in only 10 seconds. ▼▼▼



Hydro-Mechanical Control Test Machine checks the operation of the latest jet engine fuel controls with flows to 30,000 pph, and incorporates a 100 hp variable speed drive unit.

After-Burner Boost Pump Test Machine for jet engine after-burner fuel air driven boost pumps with flows to 120 gpm, pressures to 60 psi. Unit gives fast production plus maximum safety.

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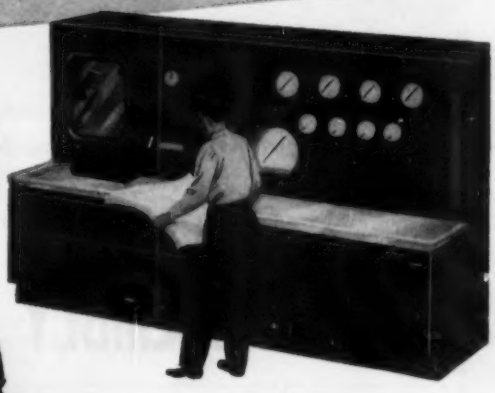

Gas Turbine Ignition System Test Machine completely tests all 28 volt DC and 115 volt, 400 cycle AC aircraft gas turbine ignition units and components under simulated operating conditions.

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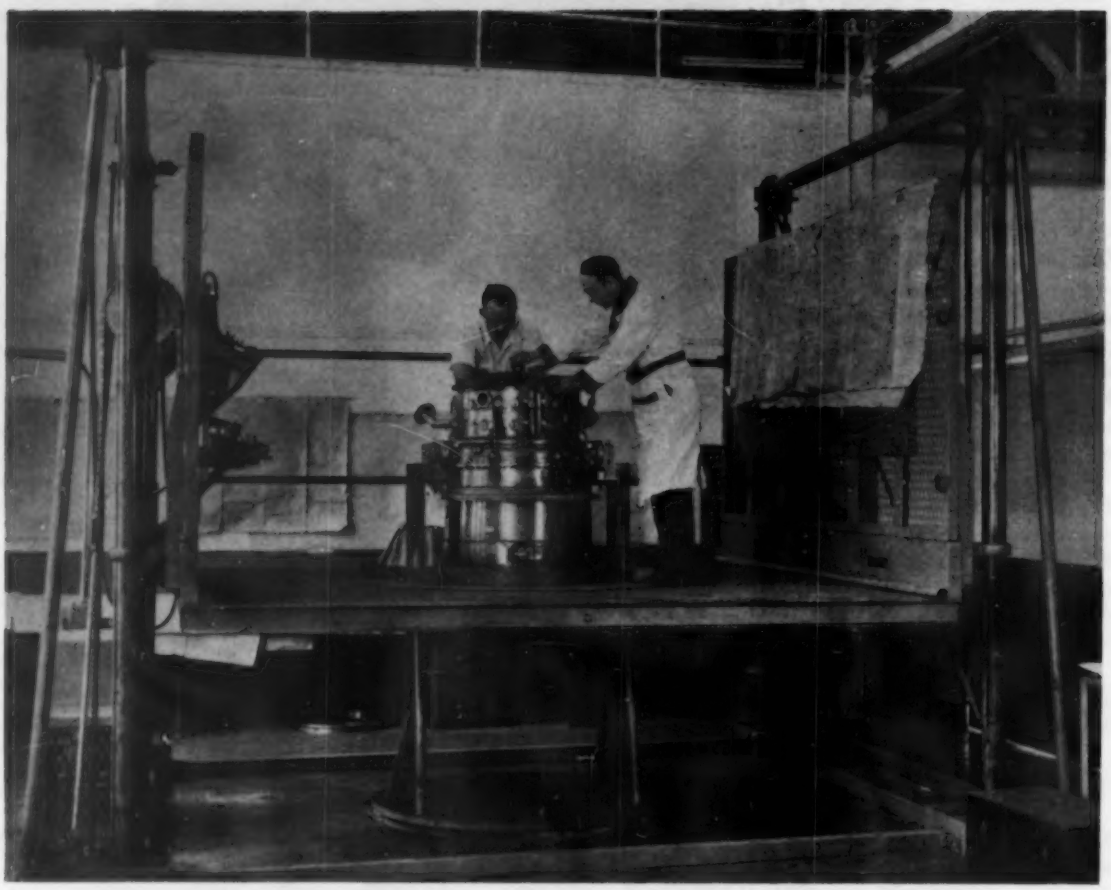

ASSEMBLERS MOVE UP and down as they put together this jet engine.

Can a hydraulic elevator be an assembly tool? It is in the production of jet engines. They are now assembled vertically. The oil powered elevator has made possible this . . .

NEW ASSEMBLY METHOD FOR JET ENGINES

• By Andrew J. Auld, Jr.

ADVANTAGES of vertical assembly line techniques on jet engines have long been obvious but the problems of providing a satisfactory work platform have often been so complex that the vertical assembly method was not used. In its stead the convenient "dolly" was used. This, however, required horizontal assembly methods for the major part of the engine.

ANDREW J. AULD, JR. *Design Engineer, Westinghouse Electric Corporation*

One of the principal disadvantages of horizonal assembly is bearing installation, especially where carbon seals are employed. It is very difficult to install the carbon seals horizontally without cracking or damaging them. Another related disadvantage is in determining whether or not the seals have been damaged during the installation process. When the vertical method is used the weight of the seal itself is sufficient to cause it to drop into position, thus eliminating tapping or forcing with the resulting possibility of damage. Vertical bearing installation also makes for easier and more accurate bearing

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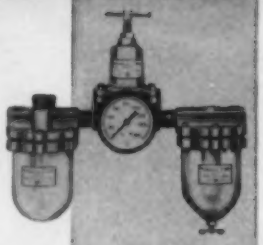
PNEUMATIC NEWS from Westinghouse

NEW LUBRICATION CONTROL . . . This new Westinghouse Type R-1 Lubricating Control Unit gives your air system complete protection. It accurately regulates air pressure —prevents air waste and excessive pressure. It regulates the injection of oil in proportion to the amount of air . . . meters the flow . . . atomizes the oil. It removes water and solid particles from the air stream. One size handles all requirements from 4 to 85 cfm at pressures up to 125 psi.



NEW FLOW VALVE . . . This new Westinghouse Type "D" Pilotair Valve controls the flow of air, oil, or water at pressures up to 250 psi. It comes as a two-way, three-way, or four-way valve with lever, treadle, pedal, button, cam, solenoid, or pneumatic operation. New seal and construction assure long life and low maintenance.

CYLINDERS . . . Westinghouse makes them in diameters from 1½" to 10", with stroke lengths up to 42". Single or double acting, with or without adjustable cushioning, for foot, flange, or pivot mounting.

PLUG-IN COUPLERS . . . Westinghouse makes these full-flow, heavy-duty, quick couplers in both the Push Type, which can be connected and disconnected with one hand, and the Sleeve Type. Two series: Interchange, for use with other makes of couplers, and Standard.

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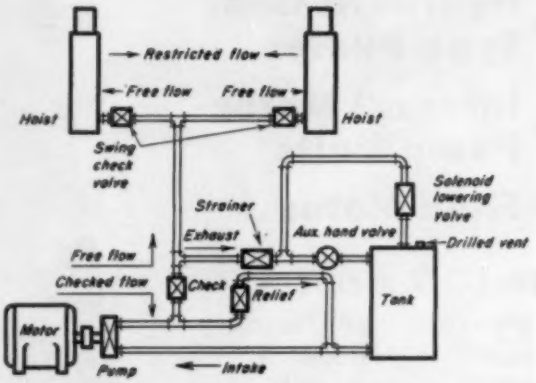
JET ENGINE ASSEMBLY

Continued

expansion measurement allowances.

The inevitable overhang during horizontal assembly also prevents certain possibilities for distortion which can be eliminated by using the vertical assembly technique.

One approach to providing a satisfactory vertical assembly method has recently been placed in operation by the Westinghouse Aviation Gas Turbine Division at South Philadelphia. It consists of a vertical engine mounting frame which is fastened



PUMP IN THE ELEVATOR lift circuit is driven only when upward motion is desired. Stopping the pump, stops upward motion and the lift is held in position by trapped oil. To lower the lift, a 2-way solenoid operated valve is opened to permit oil to drain from the lift cylinders back to tank.

to the floor, and work platform which surrounds the engine mounting frame. The versatility of the structure lies in the fact that the work platform can be raised or lowered to the desired level, thus assuring easy access to any part or parts of the engine being assembled.

The work platform is a modified four post electric hydraulic elevator, which from the standpoint of safety and simplicity, lends itself readily to this application. The center of the elevator platform has been cut away to provide clearance for the engine mounting fixture and the engine being assembled.

An electrically driven pump furnishes hydraulic power to the two hydraulic hoists which provide the lifting power for the platform. Uniform lifting at four points is assured by chain drives which are attached to the four corners of the platform.

Swing check valves restrict the flow from the hydraulic cylinders and limit the rate of descent which is regulated by a solenoid controlled lowering valve.

For this application, as a safety measure, a "deadman" type of control circuit is used. Only when the "up" button is energized will the pump operate and supply the hydraulic pressure necessary to lift the platform. In the same manner, it is necessary to depress the "down" button to cause the platform to lower. ▼▼▼

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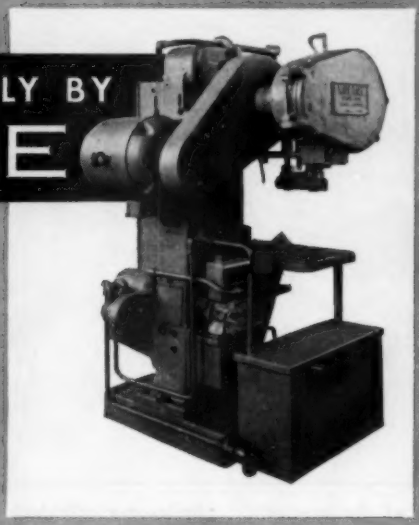
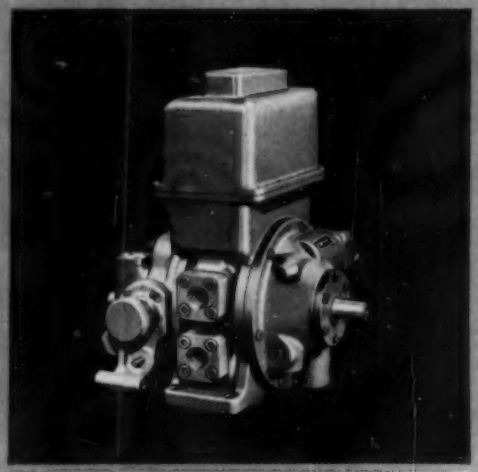
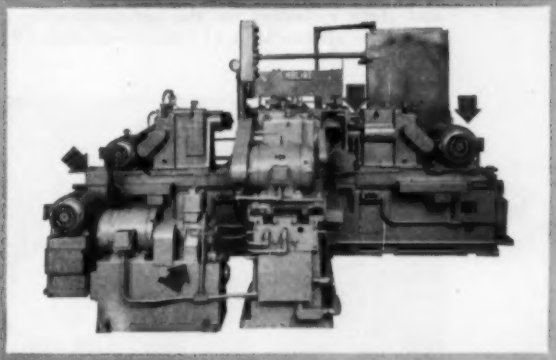
OILGEAR "JK" FEED PUMPS

USED EXTENSIVELY BY MOLINE



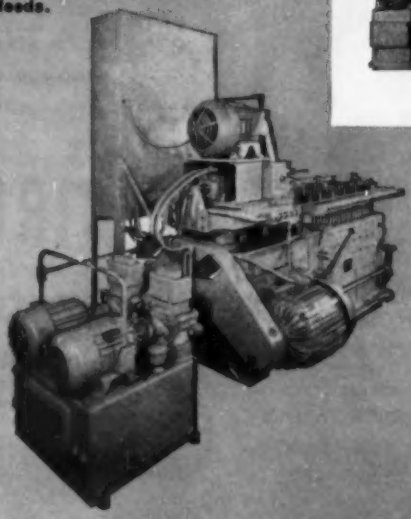


Above, Moline Drilling Machine employing "JK" Feed Pump.



Moline 4-way horizontal boring machine uses 4 Oilgear "JK" Feed Pumps.

Below, Moline special 56-spindle back-spotfacing machine using 2 "JK" units for vertical and horizontal feeds.



Below, Moline ten-foot, straight-line drilling machine using "JK" Feed Pump.

The Moline Tool Company, long established and respected in industry, has used Oilgear Fluid Power Feeds since 1925. Of Oilgear "JK" Fluid Power Feed Pumps used in its machines, Moline says these pumps *combine* the advantages found only in part in various mechanical feeds. Also, the "JK" Feed Pump provides infinitely, steplessly variable speeds; you can easily find the speed best suited to the work or condition of tools. Traverse speed can be as much as 265 times the feed rate. Coarse and fine feed rates are variable over a 20 : 1 range. Cycle time is cut drastically, production increased, costs reduced. Feed rates are maintained accurately despite varying work pressures by a built-in automatic pressure compensator.

"JK" Feed Pumps are simple, compact, electro-hydraulically controlled units, easily installed nearby or remotely. Systems need only a pump with reservoir, a double-acting cylinder, standard control and two easily connected pipes. Eliminating expensive engineering, these units can simplify design, reduce manufacturing cost, improve performance and increase saleability of machines. Manual, semi-automatic or full automatic operation. Available now in 4 sizes. Write for free literature.

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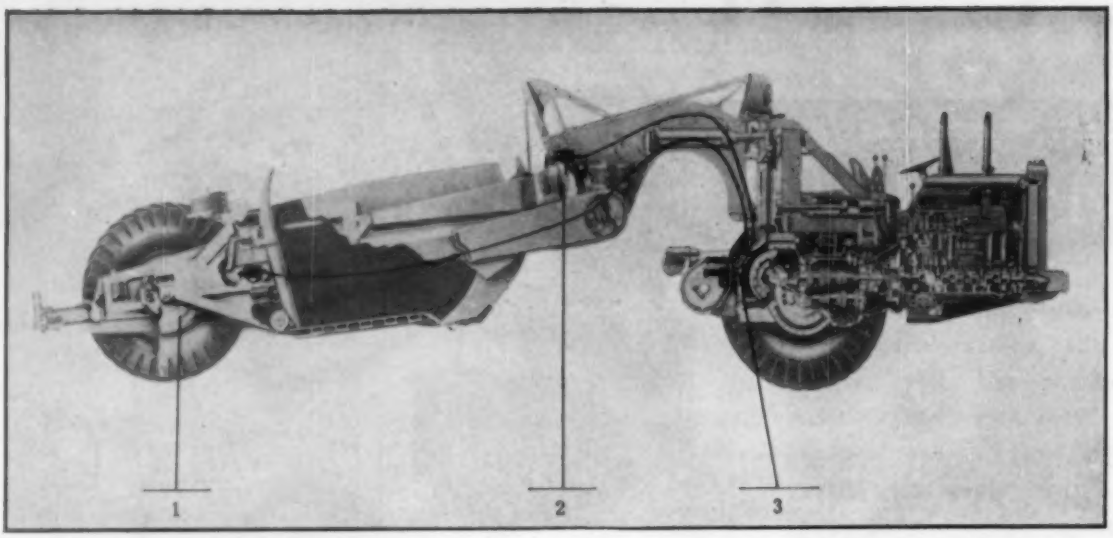


ILLUSTRATION SHOWS LOCATION of the master and slave cylinders on the scraper-tractor combination. The ejector stop (1) and bowl stop (2) actuate the master cylinders which power the slave cylinders (3) which return the control lever to the disengaged position.

What can you do with a column of oil? Transmitting a force around corners is a very easy job with oil under pressure. Caterpillar engineers used this basic principle to solve a provoking maintenance problem on cable operated scrapers.

CLOSED HYDRAULIC CIRCUIT

prevents cable breakage

CHANGING broken cables on cable operated scrapers and tractors has been an undesirable and time consuming task for operators. The frequent breakage was caused by hitting bumps or dips or making sharp turns, when the cable control clutch was engaged and the bowl and ejector were raised and forward against their stops.

In order to overcome this problem, Caterpillar Tractor Company designed and equipped their tractor-scraper combination equipment with a hydraulic device which automatically prevents meeting of the stops as the bowl raises and the ejector moves forward. It also relieves the operator from having to watch the ejector or bowl and prevents him from unintentionally allowing the stops to meet.

This simple cable saving device consists of two hydraulic spring return master cylinders which are actuated by the bowl stop or by an adjustable screw set out from the ejector stop, and two slave cylinders, which when actuated by the master cylinders automatically return the cable control lever to the disengaged position. As the ejector or bowl approaches the stops, the adjustable screw hits the lever on the master cylinder, thus hydraulically actuating the slave cylinders. The slave cylinder then pushes an arm which is mechanically connected to the control lever and returns it to the disengaged position before the stops can meet.

Selection of components for this closed hydraulic circuit depended on the required force and motion needed to disengage the control lever. Of course tremendous pressures can be developed in a closed column of oil. This makes it possible to transmit the required force through small lines and with

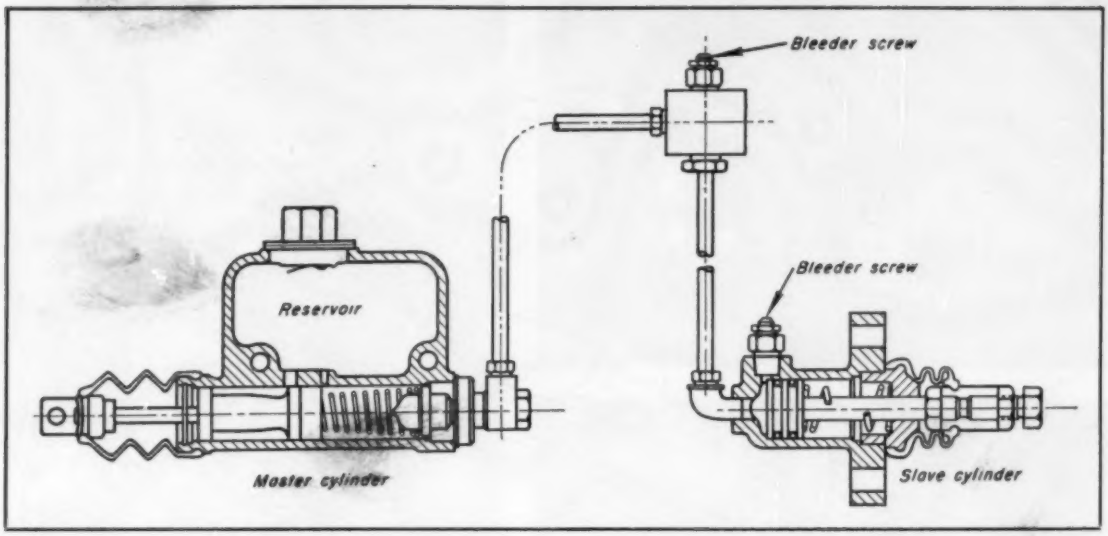
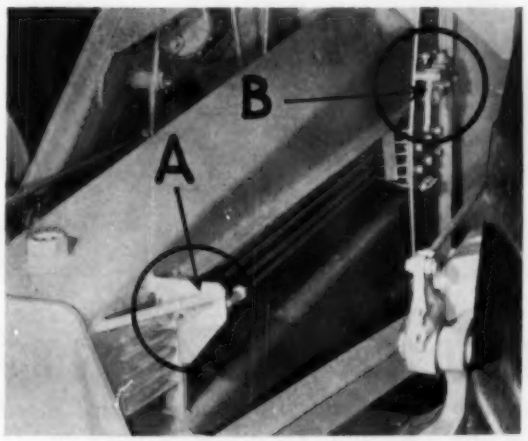


DIAGRAM OF THE MASTER and slave cylinders. Units are connected by hose. Bleeder screws keep air out of the system. O-ring seals are used on the reciprocating piston heads.

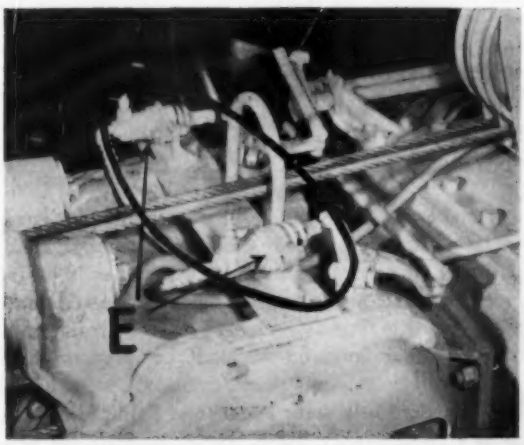
small bore master and slave cylinders. A bell crank was used on the master cylinder to reduce the stroke length in relation to travel of the actuating member. The reservoir in the top of the master cylinder provides the oil make up for any leakage. Line loss was measured at a low temperature with the correct length of line between the master and slave cylinders. Accordion-pleated boots protect the pistons from dirt and sand.

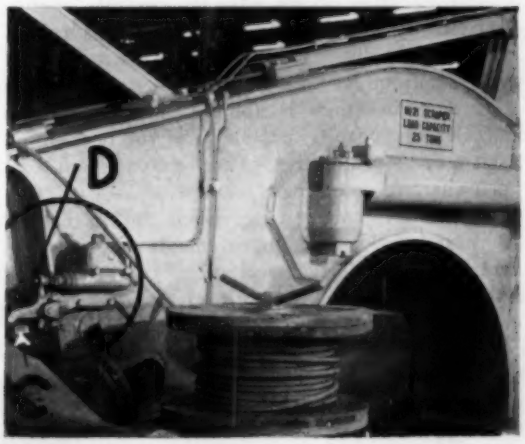
The units are easily accessible for maintenance, the master cylinder for the ejector cable being located at the forward end of the ejector track, and for the bowl lift cable it is near the upper nest of the bowl lift sheaves. Both slave cylinders are located on top of the cable control housing. ▼▼▼

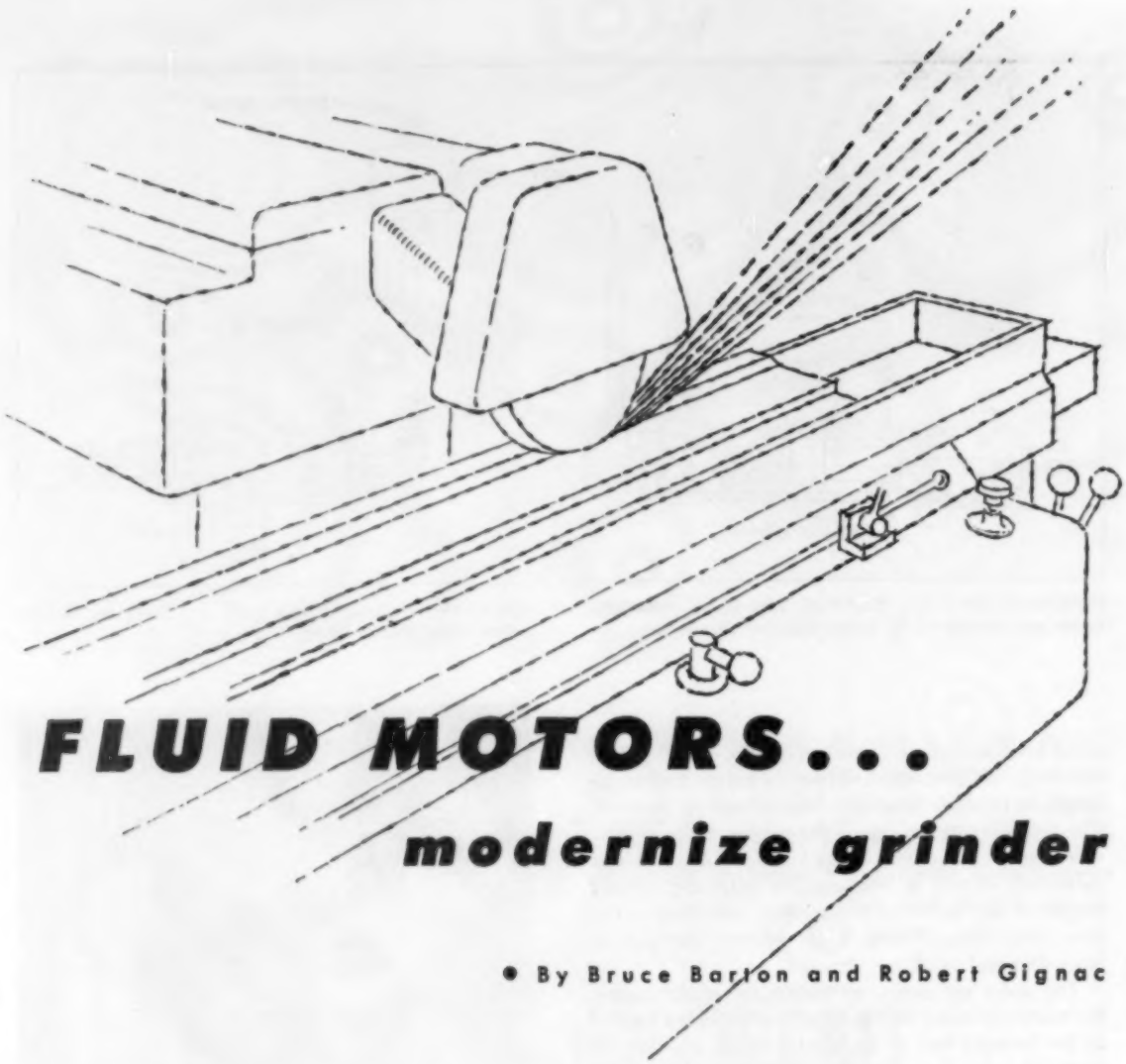


WHEN THE ADJUSTABLE SCREW on the ejector stop (A) contacts master cylinder (B) or the bowl stop (C) actuates its master cylinder (D), the hydraulically actuated slave cylinders will then return the cable control lever to the disengaged position.

SLAVE CYLINDERS (E) are hydraulically actuated when bowl stop or adjustable screw on ejector stop comes in contact with master cylinder.







FLUID MOTORS... modernize grinder

• By Bruce Barton and Robert Gignac

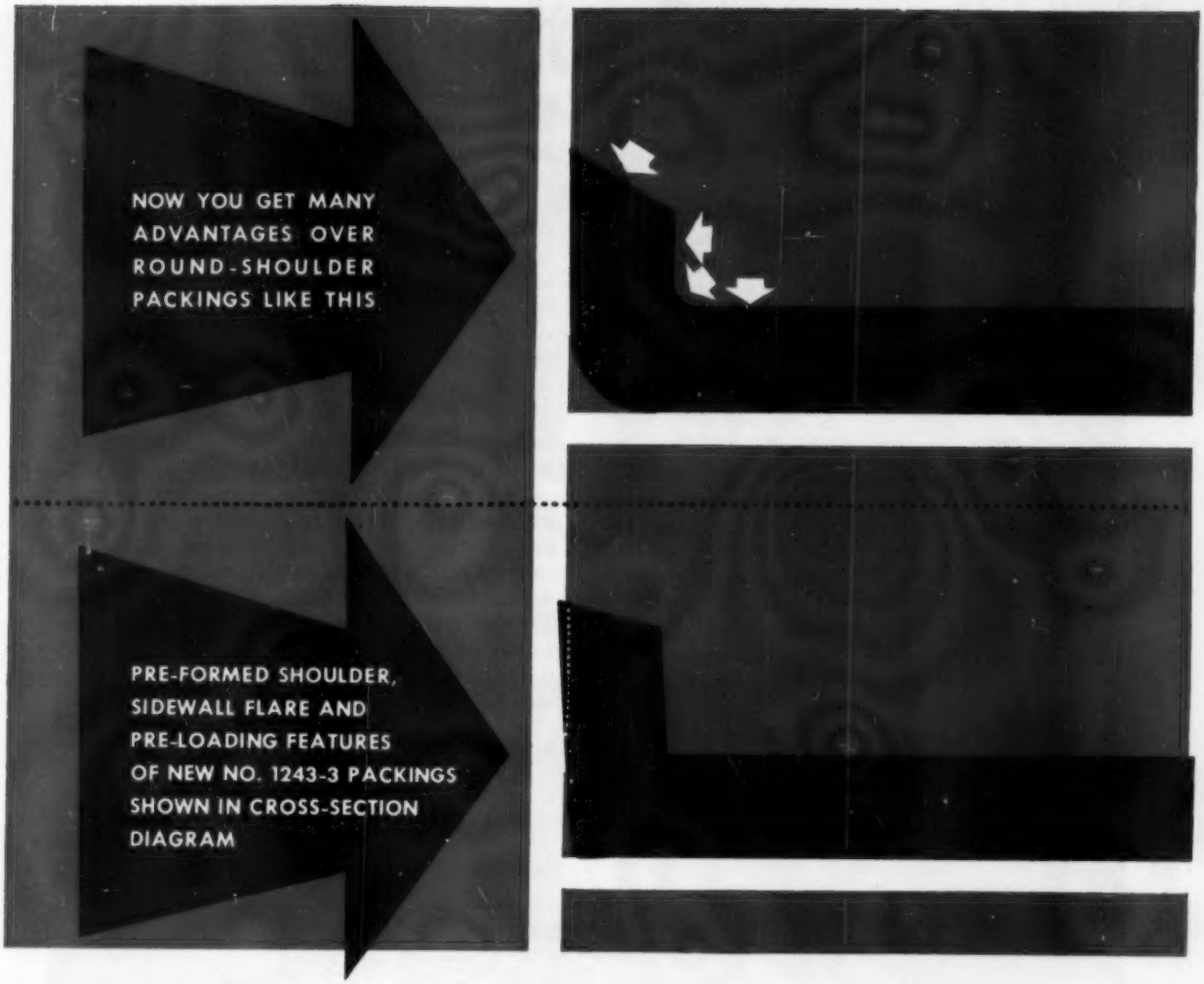
An old fashioned drive and control may bury a machine long before its time. Here's how hydraulics gave one ancient grinder years of added life.

FAST, accurate, automatic machine tools are a requirement for the modernized shop, but many present machines do not have the controls, speeds, or efficiency for high quality, economical production. Thus many businesses are faced with the problem of modernization. Junking old planers, grinders, and other such machines is not the only solution. In fact, the large capital expenditures for new equipment may be prohibitive, so conversion of old tools is an alternate solution.

The trend in machine tool design during the past 20 years is evident in improvements of drives and controls. While an old machine may have excellent fixture design, its power transmission and controls are usually inadequate. Such machines can be easily, quickly, and economically converted to modern hydraulic operation and electrical control. The great potential for this type of conversion is shown by the large number of machine tools whose full utilization can be achieved through modern hydraulics.

An excellent example of machine tool conversion has been accomplished by the Hautau Engineering Co., Detroit. A 105-inch shear-blade grinder was converted to hydraulic operation by replacement of the drive and control. An inspection of the grinder showed that it was structurally sound. The table and ways were in excellent condition. Consequently conversion rather than replacement was selected.

The converted machine is a specially designed surface grinder for shear blades used to cut bond paper. A fine, regular finish on the blades is desirable. However, in the original machine the table had a tendency to jar at each end of travel and this caused a poor finish on the blade being ground. At faster table speeds this tendency increased and limited the speed to a value lower than required to produce a good quality finish. To compensate for this


NOW YOU GET MANY ADVANTAGES OVER ROUND-SHOULDER PACKINGS LIKE THIS
PRE-FORMED SHOULDER, SIDEWALL FLARE AND PRE-LOADING FEATURES OF NEW NO. 1243-3 PACKINGS SHOWN IN CROSS-SECTION DIAGRAM

Houghton's 1243-3 packing design solves 3 problems at once!

LOOK WHAT VIM NO. 1243-3 PACKINGS . . . pre-formed and pre-loaded . . . will do for you:

FIRST, leaks at low pressure are eliminated!

SECOND, packings won't rupture at top pressures!

THIRD, friction will be substantially reduced!

It's rather revolutionary, this Houghton-developed idea of pre-forming packings. But years of use and testing have proved its benefits to you.

Our unique #1243-3 cup packings also upset the widespread idea that synthetic rubber can't be thoroughly impregnated in leather—to combine the advantages of both. Houghton packing engineers have done it!

You can imagine the superior resiliency, the lower coefficient of friction, the much tighter seal you get with our rubber-impregnated leather packings. Ask the Houghton Man for details, or write to Packing Research Dept., E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia 33, Pa.

VIM #1243-3 RUBBER-IMPREGNATED LEATHER CUP PACKINGS

. . . a product of

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Ready to give you on-the-job service . . .

jarring, considerable overtravel was necessary making a longer work stroke and longer production time.

In the present design, the table is driven by two fluid motors. These are reversed by a solenoid-controlled master control valve.

To insure against shock when the table is reversed, the master control valve has a tapered spool and pilot chokes. These prevent fast operation of the valve and consequent jarring by metering the pilot exhaust oil out of the main spool housing. The conversion has increased the maximum table speed by 150% resulting in better finishes and decreased production time.

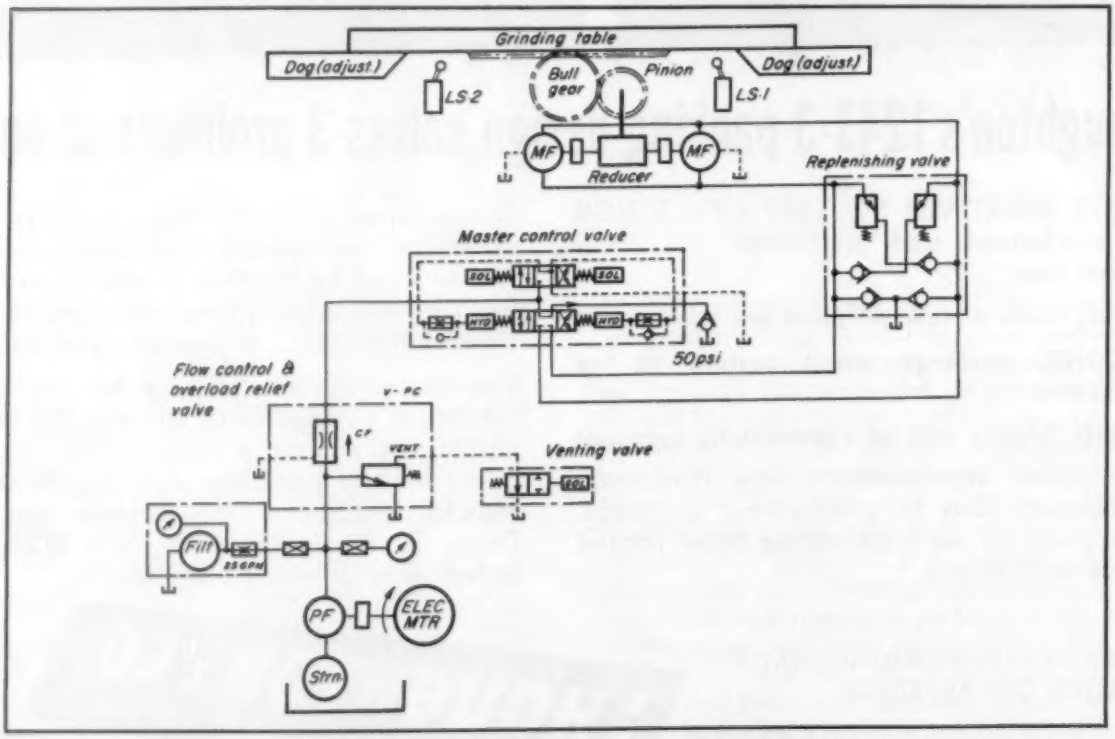
The previous drive required a large space for pulleys, belts, and pillow blocks. Because these were mounted near the operator they constituted a safety hazard. By dividing the load between two aircraft-type fluid motors, the desired compactness has been achieved and the safety hazard eliminated. The motors are mounted with a speed reducer on the grinder. Flexible couplings connect the motors to the reducer which has a double shaft extension. The motors have a displacement of .35 cu in and have a maximum rated speed of 3750 rpm. The reducer is flange mounted on the old machine housing and keyed to the old pinion gear of the table. This installation makes a small, compact drive.

Simple, fast speed control is available with the pressure-compensated flow control valve which is mounted convenient to the operator. An integral relief valve limits the operating pressure to the desired level. The venting valve which is de-energized when the table is stopped, permits the pump to discharge at zero pressure instead of through the 50-psi check valve. The check valve restricts flow from the pump on starting, so that sufficient pilot pressure is generated to operate the master control valve. The check valve prevents loss of pilot pressure as the main valve shifts throught neutral. The 1000-psi, vane-type pump has a maximum capacity of 11 gpm and is driven by a 5-hp, 1200-rpm, 440-volt, polyphase motor. Because of an atmosphere of metal dust a totally enclosed, fan-cooled motor was selected.

To counteract the inertia of the heavy table, the replenishing valve permits the fluid motors to run as pumps when the machine is stopping or while the master control valve is passing through the center neutral position. This acts as a brake on the table. The discharge is through the corresponding relief and check valves of the replenishing valve. Additional oil is supplied to the motors through the corresponding check valve of the replenishing valve.

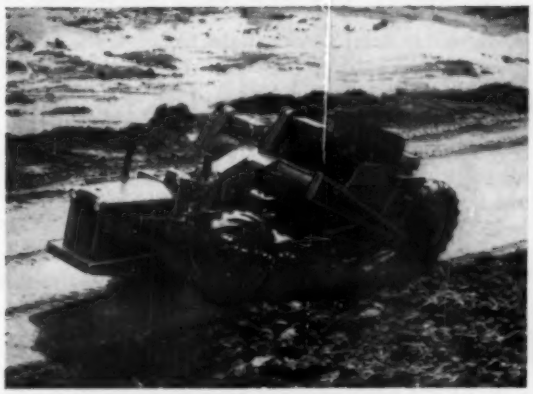
ELECTRICAL CONTROL CIRCUIT

The "Auto-Man" switch selects either automatic or manual control for reversing the table. Automatic operation is initiated by closing the 3-pole switch and pushing the "Table Forward" or "Table

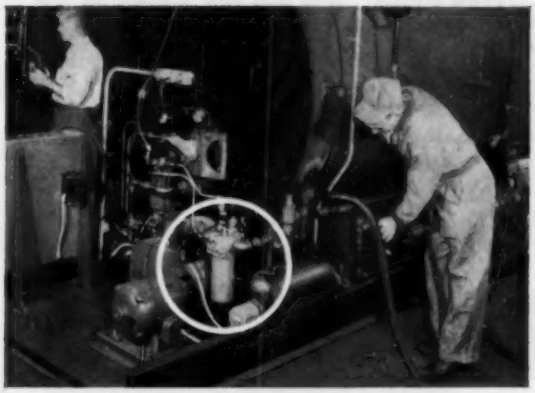


MASTER CONTROL valve controls direction of table feed. Solenoids are energized by limit switches actuated at each end of table travel.

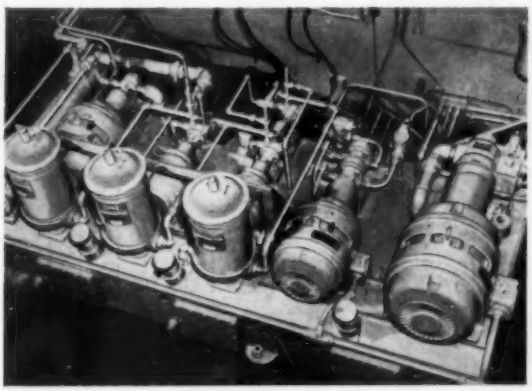
If you can pump it — Cuno can filter it



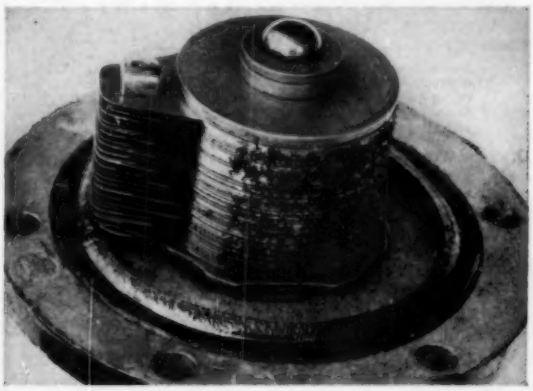
POWERFUL LeTOURNEAU-WESTINGHOUSE Tournapulls, equipped with Cuno MICRO-KLEAN 2-element lube oil filters, work efficiently in areas inaccessible to other earthmovers. When they've got a tough filtration problem, leading manufacturers like LeTourneau-Westinghouse know they can depend on Cuno for the right answer.



FUEL OIL. Leading boiler manufacturer uses continuously cleanable, all-metal Cuno AUTO-KLEANS to filter #6 and #7 fuel oil. He says, ". . . filter results are very satisfactory. Maintenance of filter is at the minimum." AUTO-KLEANS come in steel, brass or stainless; capacities range all the way from 1 GPM to 3,760 GPM.



HYDRAULIC FLUID. 50-micron Cuno MICRO-KLEAN filters protect precision parts in hydraulic and lube systems of way bed and worm drive box on this horizontal broach. MICRO-KLEAN provides full-flow filtration and protects cylinder rams, liners, valves and other parts.



LUBE OIL. Specially designed AUTO-KLEAN filter after green run in the lubrication system of automotive-type gasoline engine in military service. Note the core sand, sealing paint, lint and metal chips accumulated after only a few hours' operation — graphic proof of the need for full-flow filtration here.

4.16

CUNO **ENGINEERED FILTRATION**

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (disc-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound)

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I'm interested in effective filtration of fuel oil ☐
lube oil ☐ water ☐ coolant ☐ hydraulic fluid ☐
_____ (other fluid).
Please send me your Filtration Analysis Form ☐
Bulletin ☐

NAME_____

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ELECTRO SNAP

ONE-WAY IMPULSE SWITCH

with exclusive advantages for automation

$10.50
plus $.25 shipping charge

Model ES4-KM2
½ actual size

ELIMINATES INTERLOCKING SWITCHES AND COMPLICATED ACTUATING DOGS

Ideal for pulsing solenoid valves on air-hydraulic controls, sequencing circuits, etc., because it allows other controls to reverse or operate the same circuit. Switch sends a short electrical impulse and then switches itself out of the circuit.

GIVES MORE DEPENDABLE CONTROL

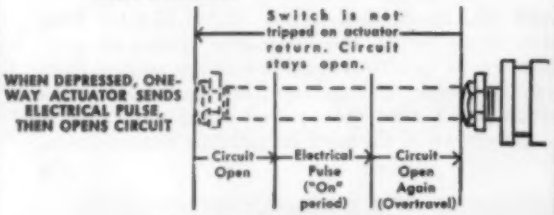
Switch replaces timers, relays, and troublesome one-way dogs to simplify circuits — cuts chances for failure. No delicate adjustments.

LOWERS COST OF CONTROL CIRCUITS

Impulse switch costs less than complicated control devices it replaces. Fewer switches are required for sequencing. Simple mounting.

SPEEDS UP AUTOMATIC OPERATION

Automatic machines can run faster because cycles can be more closely sequenced. There's no delay due to timer tolerances or extra machine motions to actuate interlock switches.


WHEN DEPRESSED, ONE-WAY ACTUATOR SENDS ELECTRICAL PULSE, THEN OPENS CIRCUIT
Switch is not tripped on actuator return. Circuit stays open.
Circuit Open
Electrical Pulse ("On" period)
Circuit Open Again (Overtravel)

SPECIFICATIONS

UL rated at 10 amps/125v AC Movement Dif. 0.020"
Operating Force 3½ lbs.

Model No.	Overtravel	"On" Period (inches of actuator travel)
ES4-KM1	3/8"	1/16"
ES4-KM2	5/16"	1/8"
ES4-KM3	1/4"	3/16"
ES4-KM6	1/16"	3/8"

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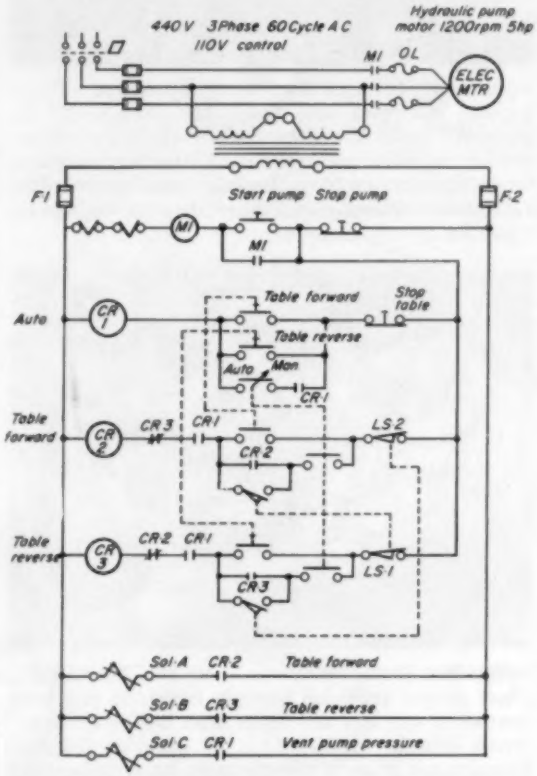
ELECTRO SNAP

ELECTRO-SNAP SWITCH & MFG. COMPANY
4220 West Lake Street, Chicago 24, Illinois

HOW TO MODERNIZE A GRINDER

Continued

Reverse" switch. This actuates relay CR-1 which closes the vent valve, and either relay CR-2 or CR-3 which actuates solenoid A or B of the master control valve. Dogs on the table actuate a limit switch at each end of table travel. If the table is in forward travel with relay CR-2 actuated, actuating LS-2 at the end of travel deactuates relay CR-2 and actuates relay CR-3. This de-energizes solenoid A and energizes solenoid B reversing the master control valve and the table feed. At the end of reverse travel the



"AUTO-MAN" SWITCH permits automatic or manual control of table reversing. In closed "Auto" position relays CR-2 and CR-3 are alternately energized by the limit switches.

opposite action occurs. Contacts of relay CR-2 in series with relay CR-3 and contacts of CR-3 in series with relay CR-2 act as safety devices to prevent actuation of both relays at the same time if a limit switch is accidentally actuated.

Manual operation is used for convenience of job set-up. By holding either the "Table Forward" or "Table Reverse" switch, the operator energizes the corresponding solenoids of the master control valve. Thus he can inch the table in either direction until the limit switch is actuated. When the operator releases the switch, the valve is de-energized and the table stops.

Relay CR-1 which controls the vent valve is actu-

Continued on page 114

"O" Rings *by Automation*

Automation, the "push-button" by-word of modern manufacturing, has come to the "O" Ring industry!

A new, fully automatic process, known as *Roto-Molding* is producing true compression molded "O" Rings of the highest quality, at production rates never before attained.

The Industry's Newest Development

Roto-Molding is entirely revolutionary in its approach to "O" Ring manufacture. It has been called the greatest advance made in this field in years. A completely automatic machine, working under precise, fully-instrumented control, is now turning out Roto-Molded "O" Rings at mass production rates and costs. But that is not the entire story. The quality of these rings is superior in several important respects:

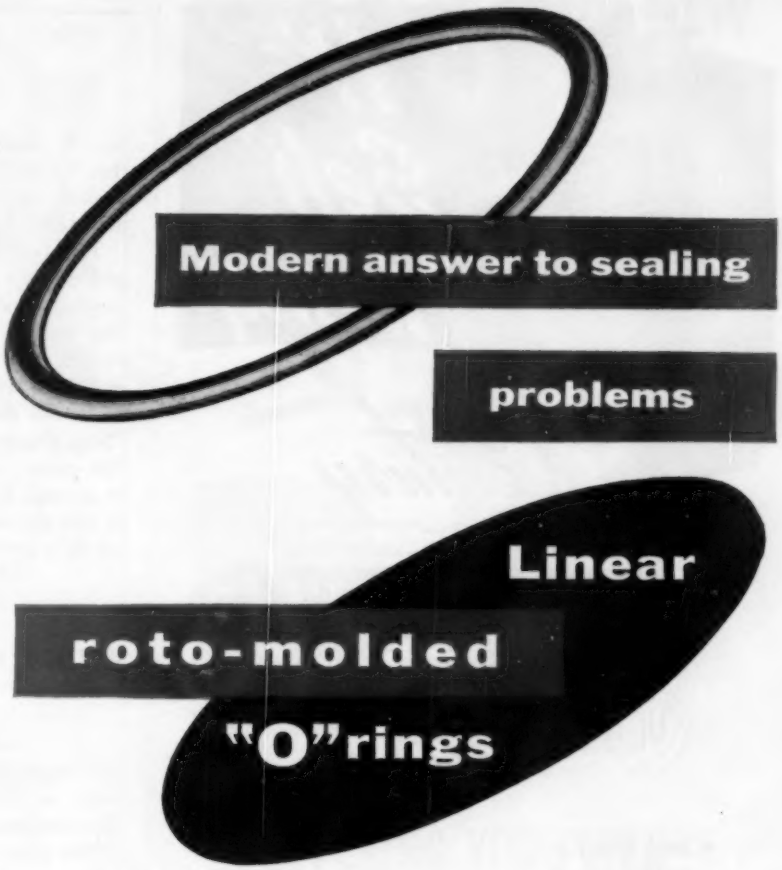
For example, every ring receives exactly the same time, temperature and pressure during the cycle, insuring improved physicals and a uniform ring.

Pre-stretched grain structure—a highly desirable quality that is impossible to achieve with injection or transfer molded rings, is an assured result with the new automatic process. The process minimizes compression set . . . and dimensional stability is achieved.

Uniform Quality Maintained

The *Roto-Molding* process also produces "O" Rings with flash-free finish and the precise, uniform tolerances needed for modern sealing applications. Handling of the rings is completely automatic, so they are free from contamination through foreign inclusions, and other minute imperfections which may be cause for rejection in non-automatic molding processes. With the *Roto-Molding* process, uniformity in quality is possible and the A.Q.L. (acceptable quality level) is maintained for all applications.

Because they are automatically mass produced, *Roto-Molded* "O" Rings are now delivered in large quantities in a fraction of the time previously required for emergency commitments. They are available in a wide variety of sizes and materials, including the newest silicone compounds. Complete information on standard or special applications may be obtained by writing LINEAR, Inc., State Road and Levick Street, Phila. 35, Pa.



Now LINEAR offers premium quality "O" Rings at mass production prices!

ROTO-MOLDING, LINEAR's new, exclusive, entirely automatic method, eliminates human error—assures precise uniformity in every ring. The maintenance of the A.Q.L. (acceptable quality level) in LINEAR ROTO-MOLDED "O" Rings assures the maximum number of acceptable units at the test stand. Time wasted in disassembly and reassembly due to faulty "O" Rings is reduced to a minimum.

ROTO-MOLDING produces "O" Rings with tough, homogeneous structure, flash-free surface and dimensional stability with improved physicals. They withstand the brutal surge and back pressure of hydraulic systems . . . resist extremes of heat and cold, and take mechanical abuse never before thought possible.

You can get LINEAR ROTO-MOLDED "O" Rings in a variety of standard and special materials to meet the requirements of use with destructive synthetic fluids, or in the latest silicones with exceptional thermal characteristics.

Write or call for the facts now!

"PERFECTLY ENGINEERED PACKINGS"

LINEAR

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FLARE-MATIC

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Fittings

- Leak Proof
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- No Special Tools Needed
- Eliminates Costly Flaring Operations
- Fittings Outlast Tube Bursting Pressure
- Made of Brass, Monel, Cadmium Plated Steel, Stainless Steel or Anodized Aluminum

A Perfect Connection Every Time

1. Insert tube into FLARE-MATIC fitting.

2. Tighten FLARE-MATIC fitting with ordinary wrenches.

The tube is flared automatically and completely inside the fitting in one, easy operation. Standard 37°, leak proof flare is formed.

Write for a copy of FLARE-MATIC catalog.

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HOW TO MODERNIZE A GRINDER

Continued

ated in manual or automatic operation when either the "Table Forward" or "Table Reverse" switch is pushed. In automatic operation, the relay remains actuated until the "Stop Table" switch is pushed.

Two switches are mounted on the grinder to start and stop the pump motor. These control relay MI in the motor starter. The motor is started with full line voltage of 440 volts by momentarily pushing the "Start Pump" switch. This energizes relay MI, and the relay locks in through a pair of its own contacts and the "Stop Pump" switch. Pushing the "Stop Pump" switch de-energizes the relay, stops the pump, and returns the master control valve to neutral. The 440-volt supply for the electric motor is transformed to 110 volts for the control circuit which is protected by fuses in both leads. ▼▼▼

WELDED VALVE PANELS

Continued from page 67

This method eliminated a major grinding problem when we semi-finish grind the front and rear—after the straightening operation.

The contour cover plate thickness over the tank and pressure paths is of different heights—one is $\frac{3}{8}$ inch the other $\frac{3}{4}$ inch. This difference makes it necessary to add a $\frac{3}{4}$ inch high mounting foot merely to balance the back side of the panel for finish grinding. After semi-finish grinding, all the holes are tapped. We found that if these holes are tapped before welding, the flux, the weld itself, and distortion cause poor pipe thread fits. The panel is now ready for finish grinding of the front face. Our original method was to just rough and finish grind the panel but this was not practical because of the additional handling and machining required after the finish grinding operation. These additional operations, after finish grinding, invariably caused damage marks on the front mounting face.

The panel is now ready for pressure testing. All panels are subjected to a 1000 psi hydrostatic test. Ordinarily, pressure on our chucking machine never exceeds 500 psi but we have made panels of this design that were subjected to 1500 psi and tested at 3000 psi. The only thing that increases when higher pressures are used is the size of the fillet welds. The equipment mounted on our standard panels is shown in Figure 2. We have also made hydraulic panels of this design measuring only 20 by 40 inches that hold from twelve to fifteen hydraulic components.

After several years experience in the manufacture of this type of panel construction we believe that the goal of a simple, trouble-free and economical panel has been achieved. ▼▼▼

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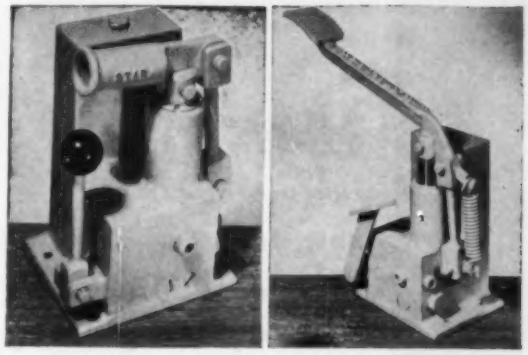
STAR Hi-Lo TWO SPEED CONCENTRIC PUMPS



- **HAND OR FOOT OPERATED WITH SINGLE LEVER OR PEDAL**
  Two speed construction provides automatic change-over during operating cycle from high speed low pressure to low speed high pressure.
- **MAXIMUM CAPACITY 10,000 P.S.I.**
  Safety overload valves—Hard chrome plated pistons—Piston stroke 1½ inch—Oil capacity 150 cu in or larger —3 models (½"-⅞") (½"-1¼") (½"-1½")

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NEW MARSH Serviceman Soundscope

. . . cuts servicing and maintenance costs

Most effective instrument ever developed for pin-pointing and identifying mechanical defects. Saves time and dollars tracking down troubles in bearings, gears, mechanisms . . . detects leaks, knocks, piston slaps—any defects that make a sound. A precision instrument of Marsh quality, sensitive to faintest sounds . . . with handy probe and headband as illustrated. A remarkable tool, moderately priced.

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NOW AN ENTIRELY NEW Bendix-Skinner HYDRAULIC OIL FILTER

OFFERING YOU FINER FILTRATION AT LOWER COST!

Here's everything you've wanted in a filter, including a built-in bypass—and all at a price equivalent to only six quarts of hydraulic oil! Yes, this newest addition to the Bendix-Skinner* line is truly the last word in efficient, yet economical, filtration. Its sturdy aluminum die cast construction assures long service—trouble-free, because it is available with either cleanable "ribbon" type elements for 40-micron filtration, replaceable "pleated" type for 10-micron filtration, or "disc" type, cleanable in 5 or ½ microns. Two ¼-inch N.P.T. inlets and two ¼-inch N.P.T. outlets make installation quick and easy. Operating pressure—100 p.s.i. Complete flow rate-pressure drop data on request.

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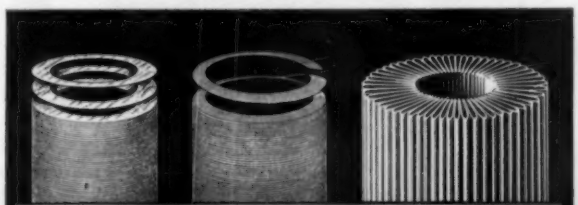

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ORIGINATOR OF **MICRONIC** FILTRATION

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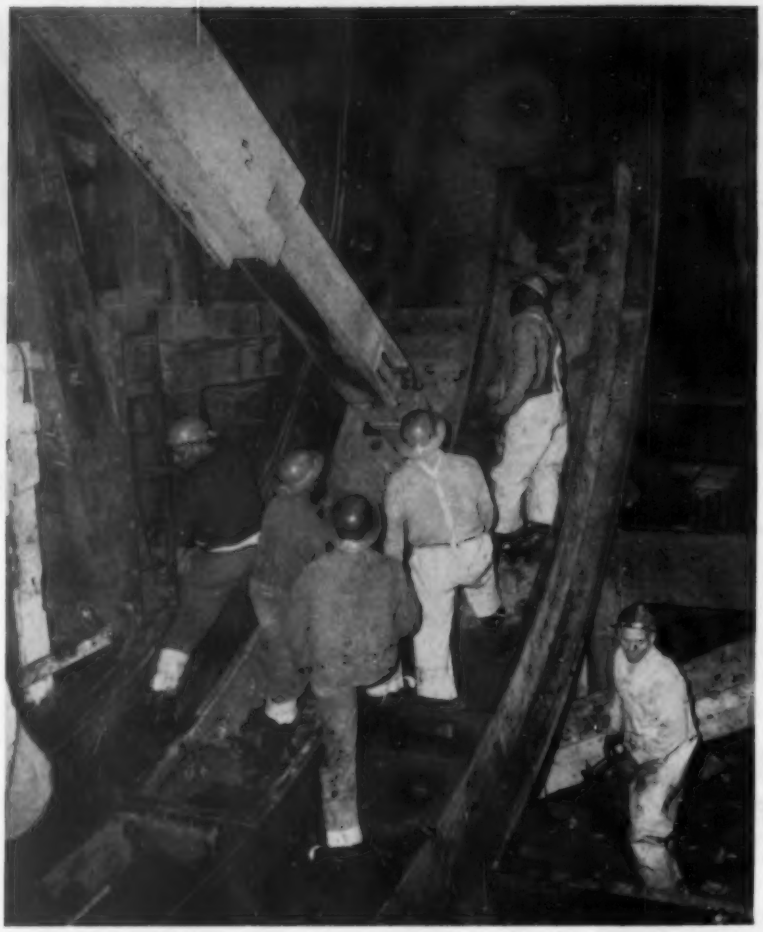
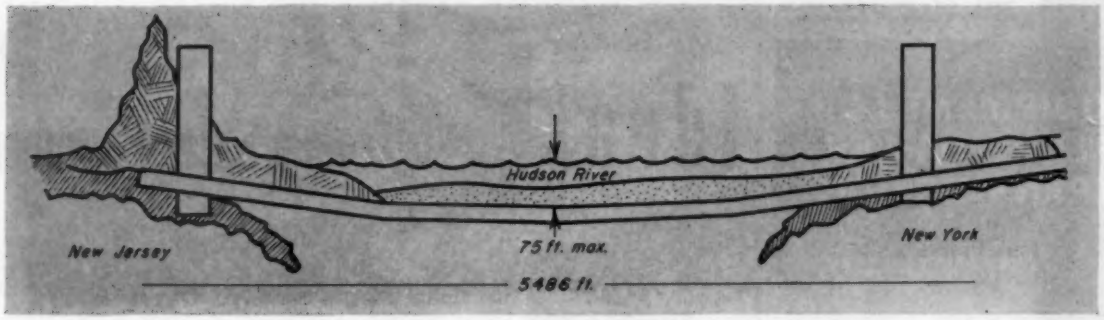


RINGS OF TUNNEL shelf are formed inside shield. While digging under river, tunnel is pressurized and men are protected by air lock.

By 1957 there will be a new tube in the Lincoln Tunnel to carry the growing traffic between New York and New Jersey. Construction of this tube makes use of . . .

ROTATING ARM SETS sections of cast iron rings. Rings are bolted together to form outer tube for tunnel. Four of the 28 hydraulic jacks are shown.

COMMISSIONER JESS HARRISON DAVIS pulls handle to actuate hydraulic jacks initiating first push of steel shield under Hudson River.



SHIELD WILL TRAVEL one mile through rock and river bed mud and silt leaving a cast iron lined, 31-foot diameter tunnel in its wake. Early in 1957 two lanes of traffic will roll through the $100 million, Port of New York Authority project doubling the rush hour capacity of the present two tubes.

. . . 28 HYDRAULIC JACKS TO PUSH BORING SHIELD

FOR the job of tunneling the third tube of the Lincoln Tunnel, a 240-ton steel shield has been constructed. Using a principle based on the shipworm which bores in wood and passes digested material out behind, the shield is propelled by 28 hydraulic jacks. As the shield progresses through the mud and silt under the Hudson River, the outer tunnel wall is built in rings using the wall of the shield as a form. As each cast iron ring is bolted in place, hydraulic jacks push against the ring and move the shield forward for construction of a new ring. The rings are constructed with the aid of a rotating arm which positions each section of the ring.

The initial push is made against 10 tunnel rings temporarily assembled in front of a 30-inch thick concrete wall.

Maximum force required to push the shield through the heaviest river muck is 200 tons per jack, or a total of 5600 tons. Depending on the resistance, hydraulic pressure will vary from 2000 to 3500 psi. The jacks have a stroke of 32 inches and a cylinder diameter of 16 inches. Controls are mounted at the rear face of the shield, and the hydraulic pumps and associated equipment are located in the contractor's plant on the New Jersey shore 500 feet from the mouth of the tunnel. As the tunnel progresses hydraulic lines are extended to the shield.

While tunneling through the silt under the river, an external pressure is created. To offset this pressure compressed air is introduced into the tube. A concrete bulkhead is installed inside the cast iron lining to maintain the air pressure. The bulkhead is pierced by four air-lock chambers, so that men and materials can enter or leave the forward working chamber without loss of air pressure.

After the tunnel has been completed and the air pressure has been shut off, the muck and silt which has been used as ballast, will be removed from the bottom of the tube. Movable forms will then be placed in the tube and an inner lining of 14 inches of concrete, together with a 14-inch-thick roadway slab and a 5-inch roadway ceiling, will be poured throughout the entire length. The roadway will constitute the roof of an air duct, through which fresh air will be pumped into the tunnel. The roadway ceiling will be the bottom of another duct used to suck exhaust gases out of the tunnel. ▼▼▼

• Since 1926 • in the application, design and manufacture—pumps, separators, hydraulic accessories.

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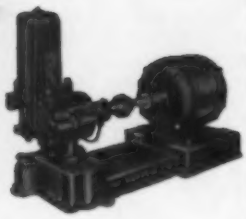

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Where water-cooling is desired for continuous service, the water-jacketed Class 25-WJ models are recommended.

Our exclusive Class 26 design air filter can be furnished as an integral part of each pump, up to 10 cfm—to produce oil-free discharge air and also conserve the lubricating oil.

Write today for Bulletin A-1289, for air-cooled pumps—and for A-1523 for the water-cooled models.

KRAISSL CO

305 Williams Ave., Hackensack, N.J.

Ideas from a Sales Engineer

Elmer F. Heiser

This is the third in a series of columns by Elmer Heiser. During his 18 years of selling air and hydraulic components, he has solved many problems and has left some unsolved. Between, much too infrequent fishing trips to Canada, Elmer makes his sales calls in northern Ohio. He is the author of the recently published book "*Air and Oil Cylinders for Industrial Applications*". Because we enjoy learning of Elmer's experiences and opinions, we've asked him to write these monthly columns. We hope you too are finding these columns amusing, interesting and informative.

Some simple questions need long answers

HAVE you ever been asked a question, so apparently simple that you think you have a ready answer even before the question is completed? Like the one thrown by the fellow with whom we worked on a new hydraulic installation. This hydraulic stuff was all new to him and throughout the designing and building stages he asked a great many questions. When the equipment was finished and tested, it performed exactly to specifications and everyone should have been satisfied. He was disturbed, however. As we wiped our hands and patted ourselves on the back, he said that while everything seemed okay there was one point which bothered him. He went on to say that it was his understanding that the pump they ordered was to deliver oil at 750 psi. Then he said, "Now if that is so, why does it only show that pressure when a cylinder finishes it's stroke?"

That's an easy question to answer but you can see that under some circumstances it would take longer to answer than to ask.

There's another question we hear every so often that starts out easy but can get involved in the answering. It varies somewhat as presented but comes back to the same thing. Essentially it is this, "What makes a good hydraulic installation?"

That should be easy to answer. Why shouldn't we say that any hydraulic installation which performs the required function without too much trouble can be classed as a good installation. Such an answer ducks the issue however, and indicates a narrow interpretation of the word "good". In order

Continued on page 120

Announcing...

THE MASTER CATALOG OF FLUID POWER PRODUCTS

1. **Alphabetical Index of Products and Manufacturers.**
2. **Index to Catalog and Manufacturers Outlets**
3. **Trade Names Index**
4. **Engineering and Technical Data Section.** Section will include specimen pneumatic, hydraulic and electrical diagrams; Fluid Power Circuits; pipe and tubing selection tables; charts of hydraulic fluid characteristics; graphic solution charts and fundamental formulae for selecting components and building circuits; etc.
5. **Where to Buy.** A local buyer's guide or "yellow pages" type of listing of independent outlets, dealers and distributors, listed alphabetically by city and state.

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(compiled by the editors of *Applied Hydraulics*)

READY OCTOBER 1955

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All this valuable information in a handsome hard cover bound single volume, thumb notch indexed for easy reference. A reference manual of infinite value to designers, engineers and specialists in fluid power application and operation. Covering hydraulics and pneumatics.

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Ideas from a Sales Engineer

Continued

to broaden the interpretation (and complete the answer) let's take the same basic question expressed in another way.

"We are building a new machine which will be hydraulically operated and we submitted the same set of operating specifications and requirements to five sources of hydraulic components. Each of the five proposals and quotations which were received guarantees to meet our operating requirements, but that seems to be the only point upon which all agree. There is a wide price difference; reservoir and motor sizes vary; there are vane, piston, and gear type pumps, some constant and others variable displacement units; some systems have more valves than others, etc., etc. Now which system is best for the application?"

The question has now been changed somewhat. Instead, of asking what makes a good system the

"We'll have to do something with the cushions, Grandma's neck is sore."

question now is "Which system is best for a particular application?" Actually, it would be almost impossible to answer the question as originally stated unless we in turn ask a good many questions to obtain enough information to make a sensible answer. We would have to know more about the purpose and required function of the system. Also we should know a great

Continued on page 122

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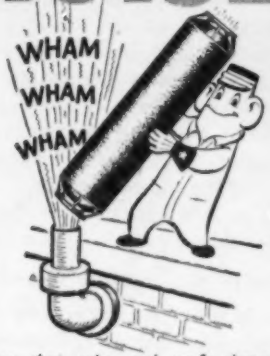

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Compare the prices and scope of NOPAK Shelf-Stock (1½ to 8" bore with 1 to 15" stroke) with competitive offerings and you'll specify these NOPAK Class 1 cylinders to cut costs.

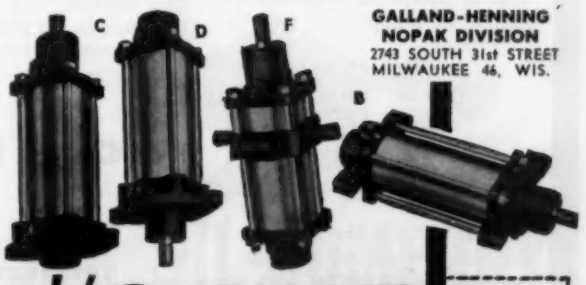
LIST PRICES F. O. B. Milwaukee, Wisconsin — Subject to Revision

Cyl. Dia. Bore	STOCK STROKE LENGTHS — All Double Acting								
	1"	2"	3"	4"	6"	8"	10"	12"	15"
1½"	24.16	25.72	26.08	26.44	27.16	27.88	28.60	29.32	30.40
2"	26.24	27.88	28.32	28.76	29.64	30.52	31.40	32.28	33.60
2½"	32.36	34.12	34.68	35.24	36.36	37.48	38.60	39.72	41.40
3"	35.04	37.28	37.92	38.56	39.84	41.12	42.40	43.68	45.60
4"	40.84	43.68	44.52	45.36	47.04	48.72	50.40	52.08	54.60
4½"	48.96	51.92	52.88	53.84	55.76	57.68	59.60	61.52	64.40
6"	66.60	70.80	72.20	73.60	76.40	79.20	82.00	84.80	89.00
8"	———	126.80	129.20	131.60	136.40	141.20	146.00	150.80	158.00

• Basic mountings "A" and "E" (see above) convertible to "B", "C", "D", or "F" (see below) by changing heads. Add 10% to above list prices (no extra charge for 8" bore.) • Piston rods have B-1, NF male thread. • Cushioning can be eliminated on either or both ends by removing spring and ball-check.

NOTE: Class 1 cylinders listed, for Air or Oil to 300 psi. Water use requires 1 week delivery for chrome plating of steel components.

NOPAK 4-Way Valves (¼ to 2" IPS) hand, foot, solenoid or pilot operated, to actuate all cylinders, also in Shelf-stock.



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High compression air or gas power is fed into the Crosman gun or rifle . . . held for trigger action by IPC cup packings. In recent tests this IPC cup packing has withstood and held pressures of 3000 psi and, after repeated use, still operates smoothly and without wear.

Whatever your packings problem, IPC engineers will help you determine the best material and the most effective design. Standard and special types are available in leather or synthetic rubber. *Write today!*

This synthetic cup packing, used in the Crosman Pellgun, is made of Buna N compound and has a high durometer.

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Cup Flange U Vee Oil Seals

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P2

Ideas from a Sales Engineer

Continued

deal about the location and conditions under which the equipment will operate. The same system which could be a good installation on a precision machine tool where hydraulic maintenance and know-how are of a high order may rate pretty low if used on an earth moving machine far back in the wilds. Likewise a relatively inexpensive gear pump, simple manual valves and dangling hose may rate as "good" on a bulldozer but be unacceptable on the precision machine.

Where Is the System Used?

It would seem that by measuring the hydraulic system against the pure mechanical functions it performs, we cannot pass judgement on its qualifications. We can narrow a mechanical function down to a specific movement and time with a definite force requirement; for example, a movement of ten inches with a force of ten thousand pounds at the end of the stroke, and ten seconds time for the travel. From such basic information we could proceed to establish the cylinder and pump sizes, the reservoir capacity, horsepower requirements, etc. However, it would certainly make a difference in the hydraulic system we select if the particular movement in one case relates to an accurate laboratory operation and in another to a cement block plant. The appearance, workmanship, type of pump and valves and arrangement cannot provide a good basis for judging a system unless the requirements are well known and firmly established.

So it is. Simple questions can wind-up with extended answers involving a lot more questions. What did I say when the fellow asked me where the pump pressure went when the cylinder moved? While I was thinking of a good answer with a couple of good questions, somebody changed the subject so I never did have to resell the pump that was already sold. ▼▼▼

Next month:

How to get 5 answers to one problem

Wherever throw-off, drip or squeeze-out is a problem...

USE SUNTAC OIL

OIL LEAKAGE MEANS:
higher lubrication costs
messy machines
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SUNTAC OIL:
cuts leakage
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In addition to its leak reducing properties, Suntac has all the high quality of expensive general-purpose oils. Suntac is fortified against oxidation to assure long oil life and against rust and corrosion to protect valuable machines. And, last but not least, because the leak-reducing agent is 100% petroleum, Suntac leaves no gummy film or residue.

For more information about Suntac, the oil especially made to prevent drip, throw-off and squeeze-out, see your Sun representative or write for your copy of Suntac Technical Bulletin to Sun Oil Company, Philadelphia 3, Pa. Dept. AH-5.

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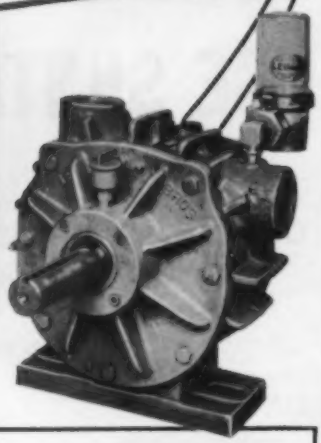
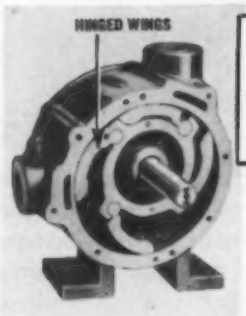
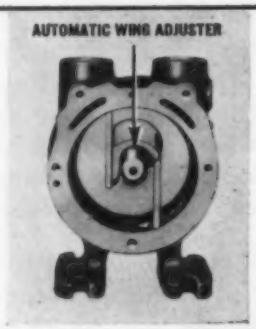
that take up their own wear!
No maintenance—no complaints—no shutdowns

LEIMAN
Rotary
AIR PUMPS
VACUUMS up to 29.9" Hg.
PRESSURES up to 20 lbs.





Patented Leiman Wings take up their own wear—maintain rated capacity for years and years.



4-WING TYPE. Vacuums to 20" Hg.; pressures to 15 lbs.; displacement to 162 cfm. Wings hinged to pistons maintain continuous sealed contact with cylinder walls by centrifugal force. Small pistons, large air chambers, greater capacity.

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Control Systems for Construction Equipment

Continued from page 76

a compact package in a machine which must be as small as practical for maneuverability. System pressures are ten to thirteen times as high as in the case of air controls.

In the Michigan tractor shovel, power actuation is used throughout to almost eliminate operator fatigue and increase efficiency. A common hydraulic system serves the torque converter and power transmission. There are also separate systems for bucket actuation, steering booster and power brakes. The only mechanical controls are the manual de-clutch for the rear axle on four wheel-drive machines and the shift between working and travel speeds. These two are used only once or twice a day while travelling from job to job.

GEAR TYPE PRESSURE LOADED PUMP

The transmission case serves as the sump for the transmission and torque converter power shift and lubricating hydraulic system. A common shaft drives the main pump for bucket actuation, and the torque converter pump. The steering pump is driven by the engine timing gear. The torque converter pump serves to pressurize the torque converter, actuate the power clutches, and pressure lubricate the torque converter and transmission.

Both the steering and main hydraulic pumps are gear type, with spring loaded wear plates. The pressure loading automatically compensates for wear, thereby avoiding leakage and loss in operating efficiency. This is the preferred type of pump for heavy duty hydraulic control systems because the life is good.

Vehicle motion is controlled by two levers on the steering column, a direction selector and a speed selector lever. The levers are connected to a valve in the upper section of the transmission, which directs an oil stream to actuate the proper clutch assembly. The valve is readily accessible and can be quickly removed for servicing on the bench.

OIL DIVERSION FOR GREATER SPEED

An oil diversion system is provided so that oil is bypassed from actuating the transmission when the brake is applied. In this way, the operator can gun the engine to speed bucket operation and have the transmission in neutral as long as the brake is applied. The transmission is engaged when the brake is released without the operator having touched the shift levers.

A torque converter cooler is located in the lower tank of the machine's radiator for compactness.

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ELIMINATES
FLARING,
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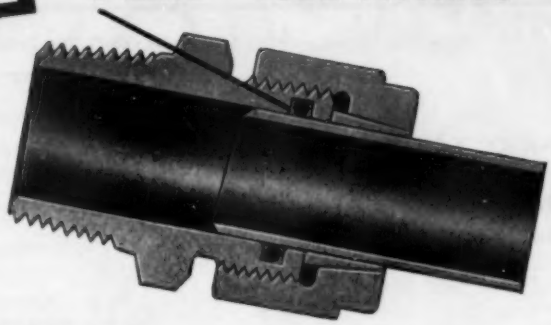

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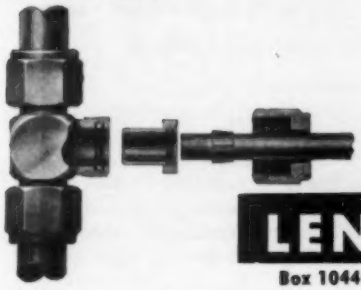

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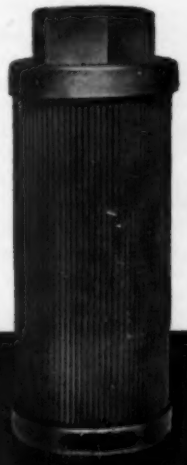

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Reservoir Type for Hydraulic and Oil Re-Circulating Machinery

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extract ferrous grit (rust, core sand, metal worn off moving parts) which circulates in the hydraulic system. You can remove these particles to eliminate scoring and abrasive wear, leakage, sticking and nonfunctioning of valves, pistons and pumps.

Frantz FERROFILTERS increase overall efficiency—and once installed, you can forget them except for infrequent cleaning. They have no moving parts; no cartridges to replace. For complete information

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Full data on how FERROFILTERS are made and operate; installation and application; sizes, dimensions and capacities.

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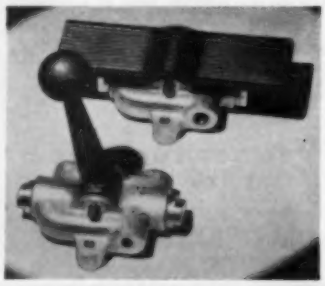
New Products continued

3-WAY VALVE
. . . hand or foot operated

Designation: Model HF-3

Design: Valve is designed for air, oil, and water pressures of 0 to 200 psi with full flow capacity of 50 cfm at 50 psi corresponding to ¼ ID pipe. Valve body is made of non-corrosive aluminum alloy 195 and



poppets are hard brass. Maximum operating temperature is 175°F.

Features: Recommended for small single-acting cylinders, valve can be furnished either locking (two positions standard) or non-locking. Locking type is available with neutral. A spring return is also available, allowing both poppet elements to remain seated. All non-locking models can be supplied with spring return for "On" or "Off" positions.

Airmatic Valve, Inc.
Cleveland, Ohio

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75,000 PSI BOOSTER

Features: Hydraulically powered boosters are available in complete

power packages with fingertip pressure control. Air-powered test boosters are also available for pressures to 75,000 psi and feature compactness and light weight. Hydraulic boosters are for heavy duty, high volume requirements. Air boosters provide economical source of pressure for less extreme applications.

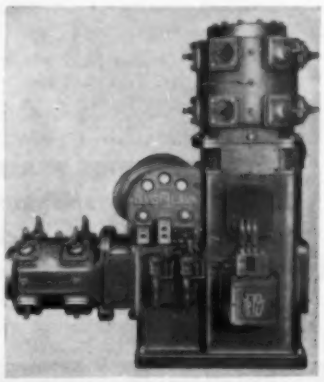
Kisling Industrial Mfg. Co.
Houston, Texas

Circle 260 on Reader Service Card

DUPLEX COMPRESSOR
. . . with air-cushion valves

Designation: Class HAE

Features: Compressor is two-stage, heavy duty, water-cooled, angle-type machine available in 125 and 150 hp sizes. Flexibility of installation is provided by reversible intake and discharge openings on the distant pieces. Replaceable tubes in intercooler permit easy main-



tenance. Full pressure lubrication is through rifle-drilled passages to all internal bearing surfaces, and main bearings are the spherical roller type. Full flow type filter installed in the line cleans all the oil before any of it goes to the various points to be lubricated. Control of the compresor to meet fluctuating demands for air results from 3-step regulation by which compressor automatically operates at full-load, half-load, and no-load capacity, to meet conditions.

Pennsylvania Pump & Compressor Co.
Easton, Pennsylvania

Circle 261 on Reader Service Card

Continued on page 128

Eastman HYDRAULIC HOSE ASSEMBLIES

DELIVER MOBILE POWER *for* ALLIS-CHALMERS

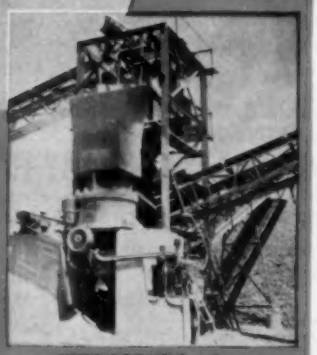
"AD-40" Motor Grader

"TS-300" Motor Scraper

Eastman Hydraulic Hose Assemblies used on steering ram of Allis-Chalmers TS-300 and TS-360 Motor Scraper. Also used on TS-200 Series to control steering, plus apron, ejector and bowl action—applying down pressure when loading equal to the weight of the scraper—38,560 lbs.!

ALL-CROP Harvester

"WD-45" Tractor



HYDROCONE Crusher

GLACIERS NEVER HAD IT SO EASY . . . The millions of years required by the glaciers to scour and alter the earth diminish to mere minutes when Allis-Chalmers earth moving and grading machinery go to work. Many of these mighty machines owe much of their ease of operation and maneuverability to hydraulic power—delivered through **EASTMAN** Hydraulic Hose Assemblies.

TODAY'S FARM YOUTH NEVER BORN "30 YEARS TOO SOON" Milestones in farm mechanization are marked by Allis-Chalmers farm machinery. Pioneering in many farming innovations resulted in such exclusive firsts as the ROTO-BALER, ALL-CROP Harvester, Rear-Engine Tractor—Power Shift Wheels, SNAP-COUPLER and Hydraulic Traction Booster. Much of the operation and control of this world famous line of farm machinery is done through hydraulic power—also applied through **EASTMAN** Hydraulic Hose Assemblies.

NATURE NEVER CRUSHED ROCK LIKE THIS . . . Hydraulic power on the HYDROCONE crusher affords "one man, one minute" product size control. It provides a rapid and convenient means of raising or lowering the crushing head. It permits compensation for wear and facilitates emptying the crushing chamber in case of power failure or for the quick release of uncrushable materials. Allis-Chalmers pioneered in this type of crusher—as **EASTMAN** pioneered in Hydraulic Hose Assemblies.

TURN TO EASTMAN for *your* Hydraulic Hose Assemblies, too. Whatever your requirements, always get your first recommendation from **EASTMAN** . . . *first in the field.* Exclusive designs, advanced engineering, unequalled production facilities and efficiency—mean unequalled economy, performance and constant customer satisfaction for you.

Eastman

first in the field

SAFEGUARDING INDUSTRY'S *Lifelines of Mobile Power*

EASTMAN MANUFACTURING CO.
Since 1914
Dept. AH-5, Manitowoc, Wisconsin

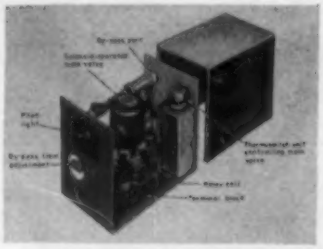
WRITE *for free Catalog 101 on Eastman Hose Assemblies*

New Products continued

THERMOSTATIC VALVE
. . . for cooling systems

Designation: Water Mizer

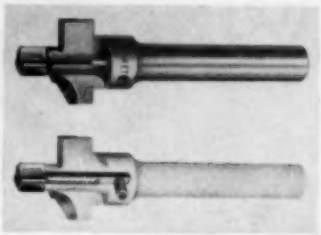
Design: Thermostat and solenoid valve are combined into a unit to monitor temperature of water returning from oil cooler and to control the flow according to the temperature. When the temperature is above a preset point, solenoid valve is energized in the open position. When the temperature falls below this point, valve is de-energized and flow is stopped. This effects a savings in water consumption and insures that water flows when required. A pilot light indicates when the valve is open.



Van Vooren Products
East Moline, Illinois
Circle 262 on Reader Service Card

CONTOUR CUTTER
. . . for hydraulic valve ports

Features: Improved standard counterbore to produce AND 100-50 port or connecting holes for hydraulic valves, fittings, etc. performs five operations instead of the four possible with the old tool. The former tool had four flutes each performing a different operation. The new tool replaces the pilot with a carbide-tipped reamer permitting five operations with a single pass. During the cutting operation, the reamer prepares the minor thread diameter for the tapping operation. All flutes of the cutter are carbide-tipped for long life and good finish in both ferrous and non-ferrous materials. Tool is now available with integral pilot, replaceable pilot, and replaceable reamer.



Sonnet Tool & Mfg. Co.
Hawthorne, Calif.
Circle 263 on Reader Service Card

PUSHBUTTON SWITCH
. . . rugged and oilproof

Designation: 1PH1

Design: Switch is 2¼ inches in diameter, providing a large target for easy manual operation and features a snap-acting spring which gives users a good "feel" of the pushbutton action. A neoprene gasket between the base of the switch and the mounting surface, and a seal boot between the button and plunger mechanism seal the switching unit from oil and other foreign matter. Unit has two double-break

"FULFLO" VALVES

By-pass, oil-relief piston type hydraulic

Standard and Flange models

NO TRICK AT ALL . . .

Just select from 5 springs, install and your FULFLO VALVE is ready to go to work . . . TO MAINTAIN CONSTANT, UNIFORM PRESSURE . . . from #0 to 500#.

NON-CHATTERING, TOO . . . because the cylindrical piston closes off the port in a shearing manner.

FOR . . . machine tool hydraulic mechanism, oil-burning equipment, rams, presses and Diesel engines. Pipe sizes: ¼" to 2"

WRITE—on your letterhead, please, for personal copy of FULFLO MECHANICAL DATA BOOK

Specify if for Valves, for Pumps or for both.

FULFLO

THE FULFLO SPECIALTIES CO. Inc.
PUMP AND VALVE MANUFACTURERS
BLANCHESTER, OHIO

circuits—one normally-open and one normally-closed. A snap-action spring causes one set of contacts to break before the other set makes contact. The force transmitted directly from the button, and the return force of the return spring insure positive actuation with each operation.

Specifications: Rating of the switch is 6 amperes (normal) and 60 amperes (inrush) at 125 volts a.c.

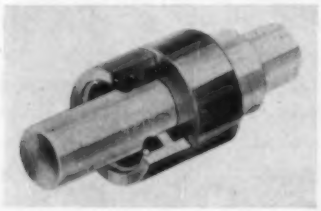
Applications: Switch is especially suited for punch presses and similar hand-operated equipment.

Micro Switch Div.
Minneapolis-Honeywell
Regulator Co.
Freeport, Illinois

Circle 264 on Reader Service Card

MAGNETIC SEAL
. . . eliminates springs

Design: Seal consists of a magnetized ring with a sealing surface which is secured to the housing, and a second ring also having a sealing



surface coupled to the shaft by an O-ring. The non-magnetized ring can move axially along the shaft until it makes contact with the magnetized ring. The magnetic force keeps the two parts in effective contact without the need of springs when fluid pressure is absent.

Features: Simplicity of construction with only three parts provides

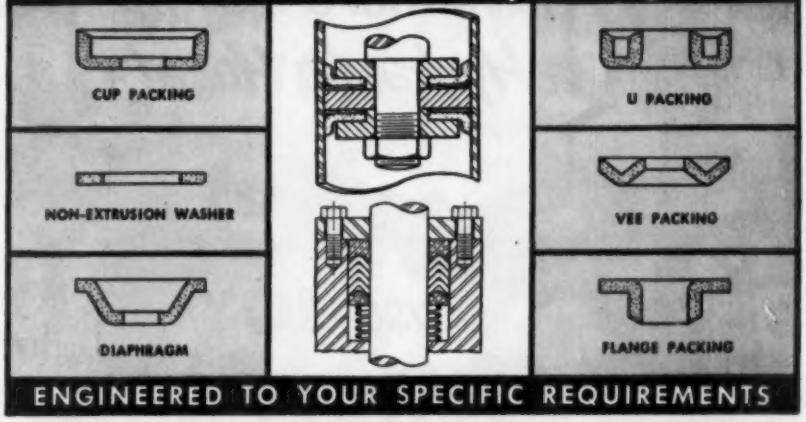
Continued on next page

MARSH *Thermo* LEATHER PACKINGS

IMPREGNATED WITH SYNTHETICS!

616:

312:



616: Has a synthetic rubber impregnated into thermo leather. Temperature will not take out this rugged treatment. At the same time it stays flexible at low temperatures of −65° without becoming hard or brittle. 616 is very resilient, springy and tough . . . resists abrasion. Used for oils, new synthetic fluids, aircraft oils, air service and resists solvents.

Makes very fine cups, vees, "U" packings, flange packings and non-extrusion back-up washers.

312: Has a synthetic impregnated into the thermo leather, one of the first developed by Marsh. It is the accepted standard in many hydraulic and pneumatic installations. Its temperature range is satisfactory for most standard applications. This utility treatment makes fine cups, flange packings and "U" packings. It is a resilient but firm packing. Used for air, oil and water service.

Marsh has developed many treatments of different combinations for leather packings. Marsh has the know how of half a century in packing manufacture and can help you with your special problem.

Thermo leather without any treatment will withstand the highest temperature range of any other known leather. It is condensed in both area and thickness to create toughness and high tensile strength. It remains permanently flexible without drying out or becoming hard. No special lubricants required.

We produce packings to adopted dimensional standards.
Write for engineering and technical data.

C. W. MARSH COMPANY
MAIN OFFICE AND FACTORY • MUSKEGON, MICHIGAN
SALES OFFICES: 75 E. Wacker Dr. Chicago 1, Ill. · 101 Park Ave. New York 17, N.Y. · 548 S. Border Rd. Winchester, Mass. · 1900 Euclid Ave. Cleveland 15, Ohio

New Products continued

ease of installation, durability, and minimum maintenance without loss of sealing efficiency. Effective under pressures up to 3000 psi and temperatures to 500°F.

Magnetic Seal Corp.
Georgiaville, R. I.
Circle 265 on Reader Service Card

TIMING UNIT
. . . contains solenoid valve

Designation: D494A

Features: Unit consists of automatic reset electrical timer, solenoid valve, pushbutton station and signal light. Available with various time ranges, solenoid valve is actuated and is initiated by pushbutton switch which also serves as an emergency stop during the timing cycle. Enclosing window and overlapping case protect against moisture and dirt and unauthorized tampering with time setting. Internal exhaust

of the solenoid valve provides an air purge. The signal light indicates during the operating time of the timer.

Emmett Machine & Mfg., Inc.
Akron, Ohio
Circle 266 on Reader Service Card

use JOY SURGEPRUF
. . . THE NON-SKIVE COUPLING
WITH THE DOUBLE-WEDGE GRIP

PERMITS THE USE OF MORE ABRASION-RESISTANT, RUBBER-COVERED HOSE

Insure longer wear in your hydraulic hose assemblies—and at the same time, save assembly time by avoiding old-fashioned skiving. Joy Surgepruf re-usable couplings make *both* advantages possible. Their exclusive "double-wedge" grip lets you use tough, abrasion-resistant, rubber-covered hose instead of the braided type—without any need for skiving the hose at the connection.

NO SPECIAL ASSEMBLY TOOLS REQUIRED

You need no mandrels or other special tools to make up Surgepruf assemblies. No extra expense or special technique is involved.

CAN BE RETIGHTENED WHEN LOOSE ON THE HOSE

Machine vibration or hose flexing can loosen any hydraulic coupling on the hose in time, but Surgepruf Couplings can be easily, quickly retightened on the job to stop a leak—*another* exclusive feature.

Surgepruf Hose Couplings are made to JIC Standards. Assemblies are available in many sizes and lengths, and in both single and double-wire reinforced types for medium-high and high pressure service respectively. *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*

Consult a Joy Engineer

JOY
HYDRAULIC ASSEMBLIES THAT GIVE YOU MAXIMUM RELIABILITY

WAD H5506

TOGGLE VALVE
. . . for panel mounting

Design: Valve seats are of semi-hard, plastic, corrosion-resistant material. Brass valves have O-ring seals and stainless steel types are available with either O-rings or Teflon V-ring packing to meet corrosive conditions.

Features: An adjustable cap nut allows tight seating closure when the operating lever is at right angles to the stem. Another adjustment permits the lever to travel in any desired plane parallel with the stem. A safety pin to lock the valve in closed position can be supplied.

Hoke, Incorporated
Englewood, N. J.
Circle 267 on Reader Service Card

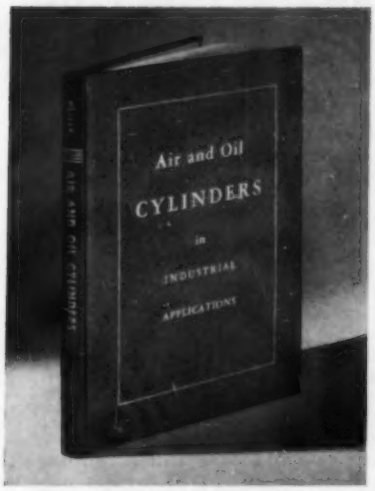
Continued on page 132

AVAILABLE NOW!

3 VALUABLE BOOKS FOR DESIGNERS, MAINTENANCE, AND PRODUCTION MEN

AIR and OIL CYLINDERS

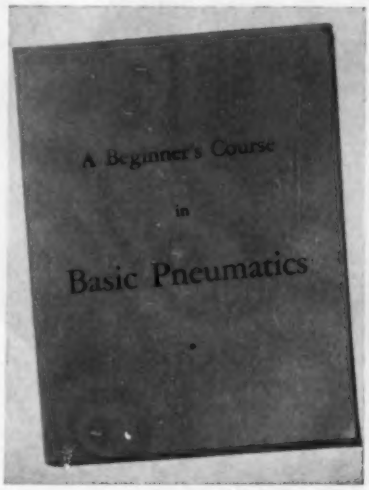
by E. F. Heiser



First book of its kind—Mr. Heiser has based his book on 18 years of first hand experience in working with plant equipment people on cylinder design, selection and application. The book is easy to read and understand. It reduces the wide, general field of air and oil cylinders to digestible, capsule form and provides background information for solving or avoiding ordinary as well as unusual difficulties.

Price $5.00

A Beginner's Course in BASIC PNEUMATICS

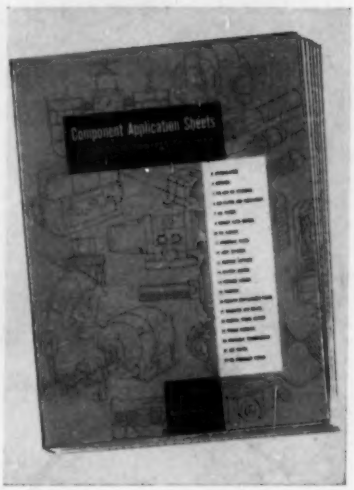


PNEUMATICS AS APPLIED TO INDUSTRIAL EQUIPMENT

A reprint of the popular series which ran in APPLIED HYDRAULICS. Arranged for individual reference as well as a practical text for training programs. It is the first systematic treatment of the fundamentals of pneumatics as they apply to industrial equipment. Divided into three sections, this 65 page booklet discusses Air Properties, Distribution Systems, and Power and Working Elements.

Price $1.00

COMPONENT APPLICATION SHEETS



This 32 page application booklet tells how each component is used in air and hydraulic circuits; what types of each product are presently being made; the standard size range; how the component operates, and general information on materials and construction. Sketches of components illustrate operating and construction features. This brief treatment of components is an excellent training aid.

Price $.50

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INDUSTRIAL PUBLISHING GROUP

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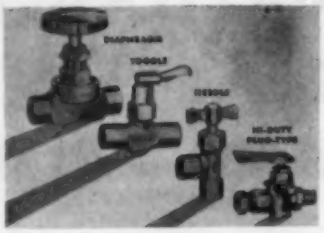
New Products continued

FLOW CONTROL VALVES
. . . for accurate regulation

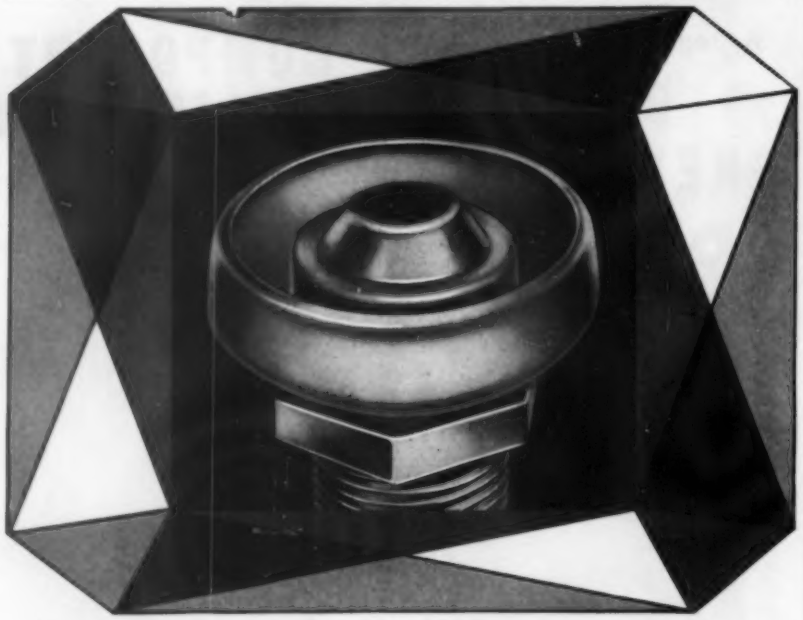


Design: New line contains needle valves, toggle valves, plug-type valves, and diaphragm valves. Needle valves have an O-ring seal which eliminates need for packing adjustment. Thread design allows closer throttling and minimum torque for valve operation. Toggle valves are designed for quick opening and closing. Lifting the lever opens the valve, valves are spring closing. Stem has O-ring seal and valve has synthetic rubber seat. Diaphragm valves are packless with solid Teflon diaphragm. Offered in 2 and 3-way types, the valves withstand unlimited operations. Plug-type shut-off valves are in 2, 3, and 4-way types.

Specifications: Valves are designed for the following pressures and temperatures: Needle valves, 500 psi, –60° to 165°F; toggle valves, 200 psi, –60° to 165°F; diaphragm valves, 300 psi, –100° to 450°F.

Imperial Brass Mfg. Co.
Chicago, Illinois

Circle 268 on Reader Service Card



AN Type Seal Cap: for protection in handling, shipping and storage of aircraft hydraulic lines and components.

Perfection .....

EXTRA QUALITY • EXTRA STRENGTH • EXTRA FLANGE PROTECTION • CADMIUM PLATED STEEL • RE-USABLE • CONFORMS TO ALL APPLICABLE SPECIFICATIONS

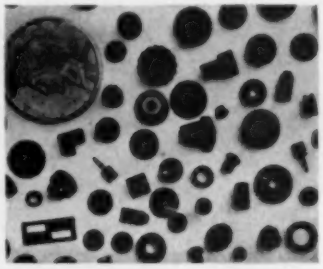
TUBING SEAL CAP, INC.

808 WEST SANTA ANITA
SAN GABRIEL, CALIFORNIA

EASTERN OFFICE
428 NEW CENTER BLDG.
DETROIT 2, MICHIGAN

MINIATURE RUBBER PARTS
. . . are injection molded

Features: Complex rubber parts can be produced with dimensional tolerances as close as .001 inch. This process permits greater quality control by eliminating the "flash" found in compression molding. Many compounds of Neoprene, Buna N, and Silicone synthetic rubbers can be injection molded.



Minnesota Rubber & Gasket Co.
Minneapolis, Minn.

Circle 269 on Reader Service Card

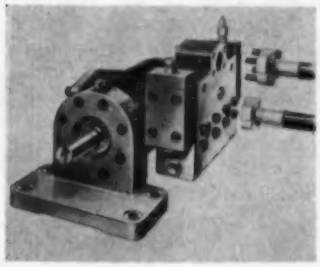
DOUBLE HYDRAULIC PUMP
. . . with integral valve panels

Designation: PF-100 series

Design: Pump is composed of two standard dual vane interchangeable pumping cartridges, with a common drive shaft and common inlet, discharging through separate outlets. The cartridges are interchangeable to permit as many as ten quick changes of capacity. Integral valve panels, mounted directly on the discharge ports, simplify installation. Separate external check valves, re-

lief valves, and unloading valves are not required.

Features: Only the oil required for effective operation of the circuit is pressurized. Entire unit, either or both pumps, or the valve panel may be removed for inspection without dismantling the piping.



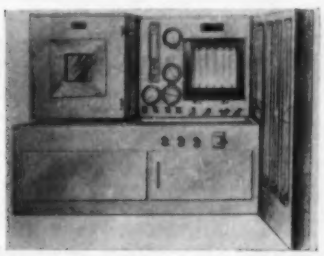
Applications: May be used to supply power to two separate systems or to a single two-pressure circuit. Especially adapted to the operation of circuits requiring substantial variation in pump volume such as hydraulic presses, die casting and clamping devices, and machine tools.

Specifications: Pumping cartridges have capacities of 3, 5, 8, and 11 gpm at 1200 rpm, 2000 psi. Total pump capacity ranges from 6 to 22 gpm.

Dudco Div. New York Air Brake Co.
Hazel Park, Michigan
Circle 270 on Reader Service Card

HYDRAULIC TEST STAND ... for aircraft use

Features: Test stand permits obtaining hydraulic pressure flow and speed test devices in combination with controlled temperatures from



one unit. Company makes available custom built, high pressure test equipment for aircraft engine manufacturing and government application and can include temperature test cabinets in one package with the hydraulic test stands.

The American Research Corp.
Bristol, Conn.
Circle 271 on Reader Service Card

Continued on next page

"Quality without compromise"

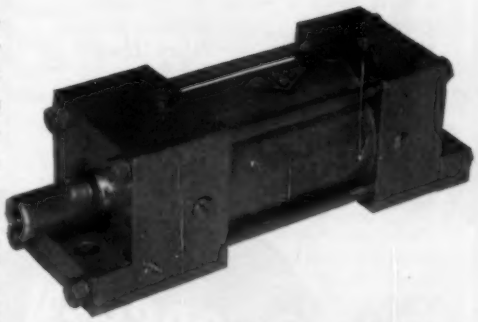
JLE

JLE SQUARE CYLINDERS

The full line from 1½ to 16 in. bores is available with interchangeable stock mountings and automatic cushioning action on standard types (Adjustable valve cushioning on special types.)

The Square Cylinders are designed for low and medium pressure air and oil service, 250 psi pneumatic, 500 psi hydraulic.

MEETS J. I. C. STANDARDS



The JLE Square Cylinders are simply designed, exceptionally rugged and built of highest quality materials, which insures top performance at lowest possible cost.

"WORKHORSE" AIR CYLINDERS

TYPE AD-5-DA **TYPE BD-5-DA** **TYPE CD-5-DA** **TYPE DD-5-DA**

JLE "Work-Horse" Air Cylinder—the dependable cylinder at a "Work-Horse" Price! Developed for our own use, the cylinder is designed for pressures to 250 psi. The "Work-Horse" Cylinder is available in bore sizes from 1½ to 10 in., in four standard mountings and furnished in both cushioned and non-cushioned models.

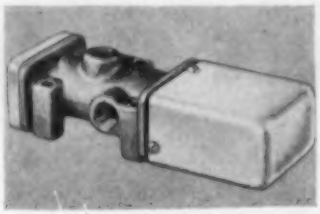
Send for the new JLE Cylinder Catalog HP 105

JAMES L. ENTWISTLE CO.
PLANT and EXECUTIVE OFFICE:
1475 ELMWOOD AVE., CRANSTON (PROV. 7), R.I., U.S.A.

Circle 46 on Reader Service Card

New Products continued

3-WAY AIR VALVES
. . . manual or electrical control



Designation: Bel-Air line

Design: Valve bodies are cast bronze with a series of polished, chrome-plated liners inserted into the body. These stationary liners are separated by protective bronze screens and are sealed to the valve body by O-rings. An aluminum spool slides freely on O-rings within the polished liners and is the only internal moving part.

Features: Mechanically actuated models include hand lever, clevis, roller, foot pedal, and treadle types. All actuators are readily interchangeable between valves of similar size. A torsion spring in the lever bracket returns the valve when pressure is released and is easily removed when spring loading is not desired. Solenoid-controlled, pilot-operated models are available for 115, 230, or 440 volts.

The Bellows Co.
Akron, Ohio

Circle 272 on Reader Service Card

EXHAUST VALVE
. . . connects to cylinder port

Features: Quick exhaust valve increases efficiency and operating speed of air cylinders by providing fast venting of air from the return side. This permits faster return strokes and more strokes per minute. An efficient silencer is available for the valve at slight additional cost.

Specifications: Available with ⅜-inch pipe ports.

AirMite Devices, Inc.
Chicago, Illinois

Circle 273 on Reader Service Card

HEAVY DUTY PUMP
. . . capacity up to 1520 gpm

Designation: Nonuplex

Features: The 9-plunger reciprocating pump offers advantages of positive displacement, high speed operation, compact construction, interchangeability of parts, low main-

Continued on page 136

Here's What
DEVELOPED BY
GOSHEN RUBBER
means to you...

Write for free 12-page O-ring brochure packed with useful information on sizes, groove dimensions and applications.

Finest facilities and technical know-how are constantly at work compounding materials, and fabricating custom-designed parts that must resist temperature extremes; oils, chemicals, acids; severe friction, swell or stretch . . . in short, the exact conditions your product must endure.

Recent Goshen developments include synthetic rubber compounds, other than silicones, which withstand such severe temperature ranges as minus 65° F. to plus 300° F.; and minus 20° F. to plus 400° F.

On *your* next rubber part, consult Goshen.

See our Facilities Catalog in Sweet's Product Design File.

Goshen Rubber Co. INC. Goshen, Ind.
CUSTOM DEVELOPMENT AND FABRICATION SINCE 1916

1555 S. TENTH ST.

ANNOUNCING THE NEW LINE OF PALLEY HYDRAULIC CYLINDERS

CUSTOM BUILT AT MASS PRODUCTION PRICES

Our 10 years experience in filling the needs of Aircraft and Heavy Industry for Hydraulic Equipment have led us to the engineering and development of this all new line of Industrial Hydraulic Cylinders. Designed especially to meet the most rigid requirements of industry. All are double action with rugged steel construction throughout. Made to take pressures up to 1500 PSI and 3000 PSI. Utilizing standard 'O' rings with leather back-up rings on the 3000 PSI types. Have male clevis mounts on both ends.

We are also equipped to Custom Manufacture to your specifications. Write us Today for further details or expert advice on your problems.

PART NO.	BORE	STROKE	SHAFT	PSI	Type of CAP	THRUST	PRICE
PH34E	3"	4"	1-1/8"	1500	External Threaded	10,500 lbs.	$32.50
PH36E	3"	6"	1-1/8"	1500	" "	"	35.00
PHE1	3"	8"	1-1/8"	1500	" "	"	37.50
PH312E	3"	12"	1-1/8"	1500	" "	"	42.50
PH34I	3"	4"	1-1/8"	1500	Inserted	"	32.50
PH38I	3"	8"	1-1/8"	1500	"	"	35.00
PH45E	4"	5"	1-1/8"	1500	External Threaded	18,750 lbs.	37.50
PH46E	4"	6"	1-1/8"	1500	" "	"	39.50
PH48E	4"	8"	1-1/8"	1500	" "	"	43.50
PH410E	4"	10"	1-1/8"	1500	" "	"	47.50
PH412E	4"	12"	1-1/8"	1500	" "	"	51.50
PH45E3	4"	5"	1-1/2"	3000	" "	37,500 lbs.	52.50
PH46E3	4"	6"	1-1/2"	3000	" "	"	54.50
PH48E3	4"	8"	1-1/2"	3000	" "	"	58.50
PH410E3	4"	10"	1-1/2"	3000	" "	"	62.50
PH412E3	4"	12"	1-1/2"	3000	" "	"	66.50
PH518I	5"	18"	2"	3000	Inserted	59,250 lbs.	85.00
PH524I	5"	24"	2"	3000	"	"	107.50
PH530I	5"	30"	2"	3000	"	"	130.00
PH636E	6"	36"	2"	3000	External Threaded	86,625 lbs.	265.00

4-WAY, OPEN CENTER HYDRAULIC CONTROL VALVE

Has built-in adjustable relief valve, set at 1000 PSI with a spring loaded neutral position. Used for controlling (1) double action cylinder of the types shown in this advertisement. Can also be mounted in series. Has 3/4" standard pipe inlet & outlet ports. 1/2" pipe thread cylinder port. Shipping weight 10-1/2 pounds. . . . . **21.50 NEW**

NEW-HEAVY DUTY HYDRAULIC CYLINDER

A rugged, heavy duty cylinder. All steel construction. Double action. Has 7" bore. 13" stroke. 2½" steel shaft. Ideal for use in hydraulic presses, leveling ramps, hydraulic tail gates, industrial machinery, road machinery, etc. Shipping weight 180 pounds. . . **95.00**

GB-8-25 TON HYDRAULIC CYLINDER
Same as above except has 8" bore, 15" stroke. Will give 50000 lbs. thrust at 1000 PSI. Shipping weight 185 lbs. **105.00**

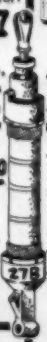
SAVE UP TO 85% ON GOV'T SURPLUS

SPECIAL SURPLUS HYD. CYLINDERS

Gov't Surplus Bargain. Produces up to 40,000 lb. thrust with a 3000 PSI line pressure. May also be used as a low pressure air system cylinder. Has a 4" bore, 18" stroke, 30½" length. Part No. 29. New & Used.

NEW **43.95** USED **29.95**

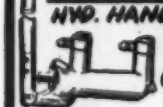
Part No. 27A. Finest Surplus. For use up to 1500 PSI. Has bore of 3½", stroke 21-5/8", shaft 1", Length 29¾". Ports 3/8" AN pipe. **35.77**



Part No. 27B. Similar to above. Will stand up to 2000 PSI. Has internal stroke cushion in both directions. Bore 3-7/8", stroke 23", shaft 1-3/8", eye-to-eye length closed is 40-3/4". Ports are 1/2" AN pipe. **45.00**

Part No. 27C – Similar to 27A above. Take up to 1500 PSI. Has 3-1/2" bore, 23" stroke, 1-1/2" shaft, 34" closed lgth. 1/2" AN pipe ports. **45.00**

HYD. HAND PUMP



12.75

Top condition. Has operating pressure of 1500 PSI. Capacity of 1.5 cu. in. per complete cycle.

HYD. HOSE & TUBING

We stock a complete line of Hydraulic Tubing and Hose as well as all types of fittings and hardware. Send us your requirements.

TELESCOPING HYDRAULIC CYLINDER

Thrust shaft is in two stages. First stage extends 39" – the second stage extends 18". Each stage works seperately. The overall length eye-to-eye is 61½". Inner shaft is 2-3/4" dia. outer shaft is 3¼" dia. Bore is 4¼". Ports are 1/2" AN pipe. **165.00**

COST GOV'T APPROX. $6000 **$1495**

AIR ASSOCIATES HYDRAULIC TEST STAND

Electric motor driven type. Has a 2500 PSI Hydreco Pump which delivers up to 10 GPM. Powered by 15 HP, 3 phase motor using 220/440 volt, 60 cycle current. Unit has selector valves, pressure gauges, flow meter, reservoir, heat exchanger and filter pressure regulator. Mounted on steel frame. Has work bench, flourescent lights and hand operated, high pressure pump for testing to very high pressures. Overall size: 8ft. long x 7ft. high x 4ft. deep.

HYD. TEST STAND – Same as above but has a Reeves variable speed reducer to control the pump output as desired. **$1895**

SURPLUS VICKERS PISTON TYPE-CONSTANT SPEED-HYD. PUMPS & MOTORS

Made to top Aircraft specifications. RPM shown below is the recommended maximum for constant speed. Quantities limited.

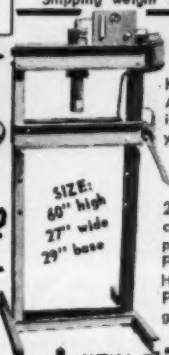
Part No.	Cu in. per rev.	GPM	PSI	RPM	PRICES NEW	PRICES USED
HYDRAULIC PUMPS						
PF9-713-20BCE	.410	5.3	1000	3000	—	$20.00
PF9-2713-20ZE	.410	5.3	1500	3000	$24.50	—
PF9-2713-10Z	.208	2.7	1500	3000	$29.75	$22.50
PF2-713-25BCE	.507	6.5	1000	3000	$32.50	$22.50
PF50-3915-30YG	1.520	19.7	3000	3000	—	200.00
HYDRAULIC MOTORS						
MF9-713-15A	.310	4.46	1000	3750	—	$18.50
MF9-713-30BCF	.600	9.75	1000	3750	$37.50	—
MF9-713-25BCF	.507	8.25	1000	3750	—	$22.50

STRATO POWER HYDRAULIC PUMPS

Designed and built to finest aircraft specifications.

PART NO.	GPM	PSI	RPM	PRICE EA.
SP-3	2	1400	3750	NEW $27.50
67WF300	3	1500	4500	USED 72.50
67WJ800	8	3000	4500	USED 87.50

NEW 10 TON HYDRAULIC PRESS



Here is a rugged 10 TON Arbor Press you can use in the shop or take with you on the job. Has sturdy frame of 4" welded channel iron. Press has 4-1/4" stroke, 2-1/2" diameter ram. A control valve operates the piston in both directions. Platform is adjustable. Has positive power Hand Pump. 2000 PSI pressure gauge. NEW **129.00**

NEW SURPLUS VICKERS HYDRAULIC TRANSMISSION

Self-contained, constant torque at all speeds with variable volume, reversible piston pump which supplies hydraulic motor. Has 2 H.P. automatic pressure dash pot for smooth control. Power output RPM is 0 to 1/3 input RPM in both directions. Input RPM 1800 continuous, 4000 intermittent. Ideal for Lathes, Duplicator set-ups, Conveyors, Drives, etc. . . . **44.50**

4" **SPLINE SHAFTS** for input and power take-off on above. **$2.50 pair**

INPUT & TAKE-OFF PLATE ASSEM. To adapt trans. to pulley drive. Has high speed bearings and 1/2" keyway shaft. Per Set **20.00**

PESCO HYD. PUMP

A gear type pump. Will deliver 2 GPM at 1500 RPM with 1500 PSI – delivers 6 GPM at 4300 RPM with 1500 PSI. Has .375 cu. in. displacement per rev. Ports are 3/4" standard pipe. 5/8" male spline drive shaft. 4" pad mount. In good condition. **14.95**

NOTE: Items shown here are only a small part of our tremendous stocks. We have over 100,000 Hydraulic Cylinders in 186 sizes and types. Also all type Valves, Pumps, Motors.

Order from this Ad. Pay by Money Order or Check. P.O.s accepted from well rated D&B firms. 1/2 Dep. with C.O.D.s. Prices F.O.B.

Palley SUPPLY CO

2263 E. VERNON AVE., DEPT. AH-5, LOS ANGELES 58, CALIFORNIA

WEAR-SAVERS THAT WON'T STEAL POWER

Hydraulic cylinder makers use Chicago Rawhide's Type G wiper seals for many reasons. Here's one: the special Sirvis leather wiper element holds its own lubricant—operates at low friction. This means negligible power loss. Another advantage: the Sirvis leather element will not trap grit and carry it—will not score the shaft. Years of dependable performance have demonstrated the ability of C/R Type G Oil Seals to exclude dirt, dust and moisture. They may be the answer to your problem, too. Write for your copy of "C/R Perfect Oil Seals."

C/R PERFECT Oil Seals

More automobiles, farm equipment and industrial machines rely on C/R Oil Seals than on any similar sealing device.

CHICAGO RAWHIDE MANUFACTURING COMPANY

1301 Elston Avenue OIL SEAL DIVISION **Chicago 22, Illinois**

IN CANADA: SUPER OIL SEAL MFG. CO., LTD., HAMILTON, ONTARIO

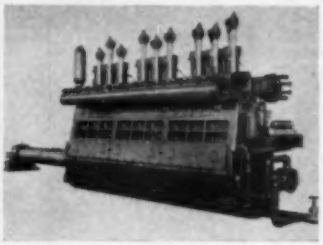
Other C/R products

SIRVENE (Synthetic rubber) diaphragms, boots, gaskets and similar parts for critical operating conditions • CONFOR: Controlled porosity mechanical leather packings and other sealing products • SIRVIS: Mechanical leather boots, gaskets, packings and related products.

New Products / continued

tenance, and minimum discharge variation. Rated at 900 bhp, the pump operates at speeds up to 300 rpm and is available with 6 different interchangeable fluid ends and 20 different plunger diameters. Changes in speed and plunger sizes permit a wide range of pumping capacities giving any desired intermediate output.

Design: Pump can be driven by engine or synchronous motor. Crankshaft is located near the floor elim-



inating the need for expensive foundations or lowering the pump below floor level. The design minimizes the discharge flow variation (pulsation) normally associated with reciprocating pumps. Total variation is only 2.2%.

Application: Pump is applicable to the metalworking, plastic fabricating, chemical processing, and petroleum industries. Used for heavy duty forging press service, die casting and extrusion, heavy duty rubber and plastic molding, and centralized hydraulic systems.

Aldrich Pump Co.
Allentown, Pa.

Circle 274 on Reader Service Card

HYDRAULIC BENDER ... for tube or pipe

Features: Bender has newly developed frame for use with pipe; rigid conduit; thinwall conduit; and tubing of hard or soft copper, aluminum, or steel. Bends up to 180 degrees are possible. This unit is for use on the job and eliminates having several different benders.

Tol Bender, Inc.
Milwaukee, Wisconsin

Circle 275 on Reader Service Card

READER SERVICE CARD

new | IDEAS • FACTS • CATALOGS
PRODUCT INFORMATION

FIRST CLASS
PERMIT No. 8066
SEC. 34.9 P. L. & R.
CLEVELAND, OHIO

BUSINESS REPLY CARD
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3¢ POSTAGE WILL BE PAID BY: *Reader Service Department*

APPLIED HYDRAULICS

1240 ONTARIO STREET • CLEVELAND 13, OHIO

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PRODUCT INFORMATION

PLEASE PRINT MAY, 1955 do not use after 8-15-55

Name _____ Position _____

Company _____ Kind of Business _____

Street _____

City _____ Zone ____ State _____

PLEASE SEND ME ADDITIONAL INFORMATION AND LITERATURE ON ITEMS CIRCLED BELOW.

1	18	35	52	69	86	103	120	137	154	171	188	205	222	239	256	273	290	307	324
2	19	36	53	70	87	104	121	138	155	172	189	206	223	240	257	274	291	308	325
3	20	37	54	71	88	105	122	139	156	173	190	207	224	241	258	275	292	309	326
4	21	38	55	72	89	106	123	140	157	174	191	208	225	242	259	276	293	310	327
5	22	39	56	73	90	107	124	141	158	175	192	209	226	243	260	277	294	311	328
6	23	40	57	74	91	108	125	142	159	176	193	210	227	244	261	278	295	312	329
7	24	41	58	75	92	109	126	143	160	177	194	211	228	245	262	279	296	313	330
8	25	42	59	76	93	110	127	144	161	178	195	212	229	246	263	280	297	314	331
9	26	43	60	77	94	111	128	145	162	179	196	213	230	247	264	281	298	315	332
10	27	44	61	78	95	112	129	146	163	180	197	214	231	248	265	282	299	316	333
11	28	45	62	79	96	113	130	147	164	181	198	215	232	249	266	283	300	317	334
12	29	46	63	80	97	114	131	148	165	182	199	216	233	250	267	284	301	318	335
13	30	47	64	81	98	115	132	149	166	183	200	217	234	251	268	285	302	319	336
14	31	48	65	82	99	116	133	150	167	184	201	218	235	252	269	286	303	320	337
15	32	49	66	83	100	117	134	151	168	185	202	219	236	253	270	287	304	321	338
16	33	50	67	84	101	118	135	152	169	186	203	220	237	254	271	288	305	322	339
17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306	323	340

READER SERVICE CARD

new | IDEAS • FACTS • CATALOGS
PRODUCT INFORMATION

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3	20	37	54	71	88	105	122	139	156	173	190	207	224	241	258	275	292	309	326
4	21	38	55	72	89	106	123	140	157	174	191	208	225	242	259	276	293	310	327
5	22	39	56	73	90	107	124	141	158	175	192	209	226	243	260	277	294	311	328
6	23	40	57	74	91	108	125	142	159	176	193	210	227	244	261	278	295	312	329
7	24	41	58	75	92	109	126	143	160	177	194	211	228	245	262	279	296	313	330
8	25	42	59	76	93	110	127	144	161	178	195	212	229	246	263	280	297	314	331
9	26	43	60	77	94	111	128	145	162	179	196	213	230	247	264	281	298	315	332
10	27	44	61	78	95	112	129	146	163	180	197	214	231	248	265	282	299	316	333
11	28	45	62	79	96	113	130	147	164	181	198	215	232	249	266	283	300	317	334
12	29	46	63	80	97	114	131	148	165	182	199	216	233	250	267	284	301	318	335
13	30	47	64	81	98	115	132	149	166	183	200	217	234	251	268	285	302	319	336
14	31	48	65	82	99	116	133	150	167	184	201	218	235	252	269	286	303	320	337
15	32	49	66	83	100	117	134	151	168	185	202	219	236	253	270	287	304	321	338
16	33	50	67	84	101	118	135	152	169	186	203	220	237	254	271	288	305	322	339
17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306	323	340

FUSE PROTECTION
. . . for remote control switch

Features: Remote control switch is now equipped with a control line fuse and adapter. The adapter may

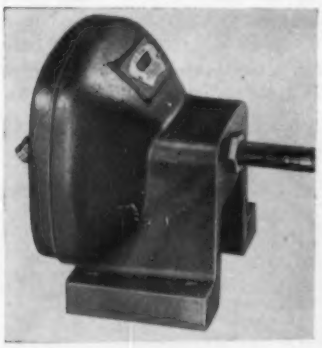
be purchased as a separate item and added to an existing switch or may be obtained as an integral part of a new switch. A-c switches are now rated 600 volts, 30 through 200 amperes. D-c switches are now rated 250 volts, 30—60—75 amperes.

Automatic Switch Co.
Orange, New Jersey
Circle 276 on Reader Service Card

AIR RAM
. . requires no lubrication

Designation: Model 70

Design: Ram has heavy duty diaphragm rigidly gripped between two ground iron surfaces. Unit has no piston cups or packings to leak or wear out.



Features: Any force up to 1 ton is obtainable with a standard line pressure.

Specifications: Stroke is ⅝ inch with spring return. Threaded ram screw has 2½-inch adjustment.

W. R. Brown Corp.
Chicago, Illinois
Circle 277 on Reader Service Card

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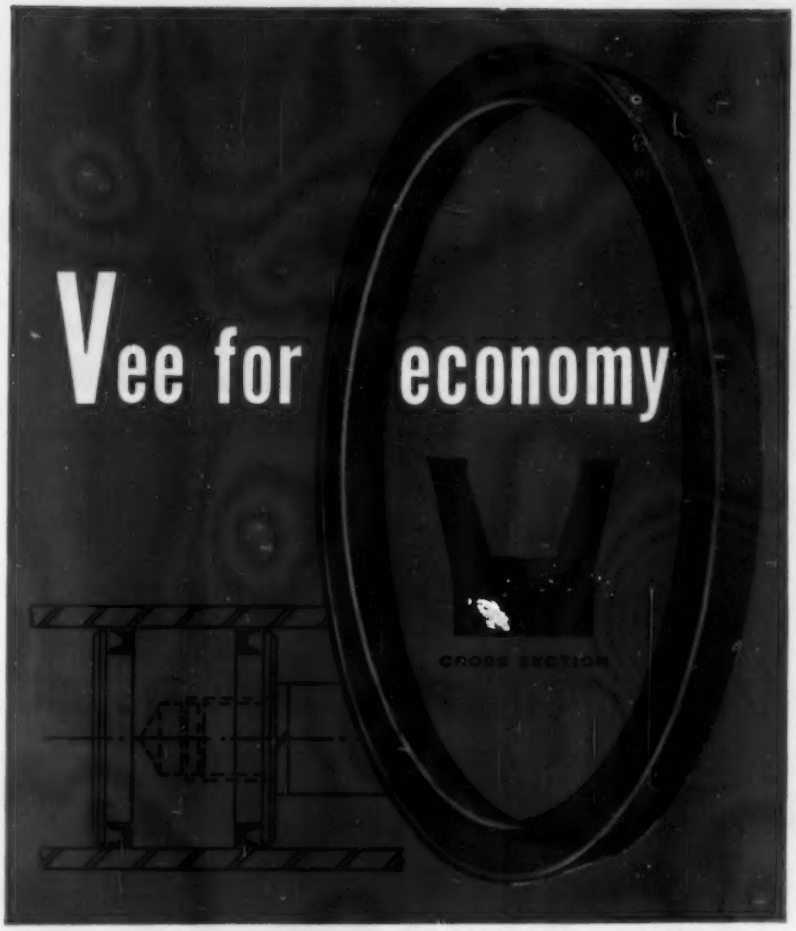


SEALS BETTER, COSTS LESS, SAVES MACHINING

A single C/R Sirvene (synthetic rubber) Block Vee, in most cases, will seal as effectively as an entire stack of ordinary multiple vees. Assembled in the groove of a hydraulic piston, the Block Vee will permit the use of larger tolerances, but will not roll or twist like an O-ring. The double-angled lip provides greater flexibility with lower friction and longer service life. Under pressure both lips are loaded to form an effective seal up to 5000 psi. Perhaps this part will help you design for lower cost. Ask a C/R Sirvene engineer.

C/R SIRVENE
SCIENTIFICALLY COMPOUNDED ELASTOMERS

CHICAGO RAWHIDE MANUFACTURING COMPANY
1301 Elston Avenue SIRVENE DIVISION **Chicago 22, Illinois**
IN CANADA: SUPER OIL SEAL MFG. CO., LTD., HAMILTON, ONTARIO

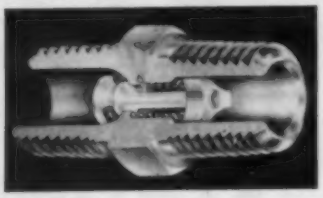
Other C/R products

OIL SEALS: Shaft and end face seals for all types of lubricant retention and dirt exclusion • CONPOR: Controlled porosity mechanical leather packings and other sealing products • SIRVIS: Mechanical leather boots, gaskets, packings and related products.

Circle 29 on Reader Service Card

New Products continued

CHECK VALVE
. . . 0 to 10,000 psi range



Designation: 2300 Series
Features: Floating poppet design is not affected by foreign particles in the fluid and eliminates wire drawing across the seat. The spherical metal seat assures perfect seating and support for the O-ring which serves as a sealing member and absorbs the closing shock.

Construction: Valve is of strong, one-piece body and is available in several body and O-ring material combinations to provide a versatile and economical, dead-tight sealing, high pressure check valve for virtually any liquid or gas service.

James Pond Clark
Pasadena, California
Circle 278 on Reader Service Card

Why "Superior" (SAE) hydraulic tubing practically eliminates failure in critical hydraulic systems

The production of Superior (SAE) Hydraulic Tubing is carefully controlled from the melting of the steel to the final testing of the finished tube. The steel used is a non-aging type. It will not age harden in storage racks. Carbon content is held to 0.12% maximum (JIC Standards permit 0.18% and SAE Specifications 0.15%).

Mechanical properties more closely approach those of copper than any other steel products. Elongation, for instance, is 35% min. in 2" for tubes of ⅜" x .035" wall and over. This means that the tubing is easily hand bent and flared.

A clean, bright OD-ID finish is the natural result of the cold drawing and bright annealing practice standard at SUPERIOR, and the ends, both outside and in, are deburred. Furthermore, all tubing is thoroughly tested, as the pictures on the right show. Such quality practices give SUPERIOR tubing a tremendous advantage over annealed mechanical or pressure tubing—make it practically troublefree.

The selection of the proper tubing for your application depends on three factors: pressure, velocity and flow. Write for Superior Hydraulic literature. It lists recommended working pressures for Superior (SAE) Hydraulic Tubing and gives you the velocity and flow information needed to calculate the proper ID for tubing used in your equipment. Use the coupon.

TUBING MUST FLARE without difficulty and without forming minute surface notches or breaks. Each order of Superior (SAE) Hydraulic Tubing is tested for flareability.

EVERY SINGLE LENGTH of Superior (SAE) Hydraulic Tubing is 100% hydrostatic tested.

SUPERIOR TUBE COMPANY
2030 Germantown Ave., Norristown, Pa.

☐ Send me free Superior (SAE) Hydraulic literature.

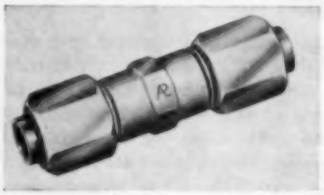
☐ Send me a free sample of hydraulic tubing _____" OD and _____" wall to be used for _____

☐ Send the name and address of the distributor nearest me.

Name.....
Title.....
Company.....
Street.....
City.....Zone.....State.....

UNION
. . . offers interchangeability

Designation: HHBTX and HHBU
Features: This new long union is available in flare type and flareless



type. Its length is the same as the union tee, the male outlet tee, and the union cross providing interchangeability with these fittings. This is desirable for test hook-up purposes.

Parker Appliance Co.
Cleveland, Ohio
Circle 279 on Reader Service Card

AIR PUMPS
. . . base area reduced

Features: The use of smaller, more compact motors and belt drive mechanisms has resulted in a 40% over-all reduction in base sizes. A pump unit having a former base area of 14 x 30 inches now

measures only 13 x 20 inches. Similar size reductions run through the complete line of models in capacities up to 29.9 in. Hg. vacuum and 20 psi, displacements from 1 to 162 cfm, speeds from 600 to 1725 rpm, and horsepowers from ¼ to 10 hp.

Leiman Bros., Inc.
Newark, New Jersey
Circle 280 on Reader Service Card

DIAPHRAGM
. . . strokes like a piston

Designation: "Sensater"

Specifications: 7-inch diaphragm can stroke ⅛ inch and displace 23 cubic inches of fluid. Units have been tested for 250,000 cycles stroking 5/16 inch at 500 to 600 psi

showing no sign of failure. The 3-ply diaphragm can withstand 5400 psi.

Applications: For use in hydraulic or pneumatic systems for pressure transmission, controlling, and positioning.

Martin-Decker Corp.
Long Beach, Calif.
Circle 281 on Reader Service Card

AIRCRAFT PRESSURE HOSE
. . . approved by CAA

Designation: SSFR 3800-10

Features: Propeller feathering pressure hose assembly has successfully passed the CAA Technical Development and Evaluation Center Fire tests and is approved for com-

mercial aircraft. A specially strengthened hose construction plus compression-type, blowout-proof fittings supplied in either AN or AC configurations enable the hose to withstand minimum burst pressures to 7000 psi and operating pressures to 1650 psi. Operating tempera-

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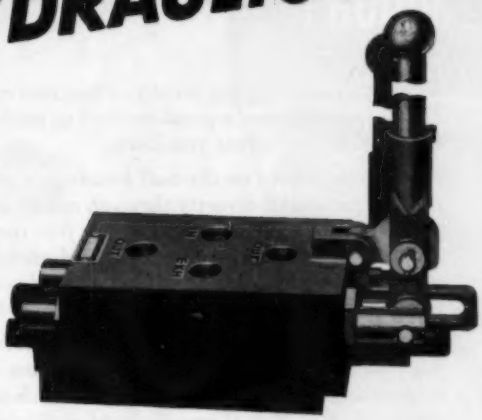
Quick-As-Wink®
HYDRAULIC VALVES



Hand Lever and Pilot Cylinder Types—pressures to 3000 psi.

Have won industry wide recognition for unsurpassed dependability

• Positive and fast acting, Quick-As-Wink Control Valves are designed and built to meet the most exacting requirements. Bodies of hydraulic valves are either forged or milled from solid bars. The hollow, radially ported, stainless steel plungers are chrome plated and polished to minimize wear. All parts are readily accessible and maintenance—that consists mostly of the very occasional replacement of the packing — can be done easily **in the field** without even disconnecting the piping. This avoids the necessity of returning valves to the factory for servicing or maintaining large standby inventories. Let us recommend the sizes and types that will meet your requirements best. Write for Bulletin 531. It gives full details.

Ask us also about . . .

DOUBLE PILOT CYLINDER HYDRAULIC VALVES operated with air or hydraulic pilot cylinders—3 position; neutral, compound-on or compound-exhaust.

DOUBLE SOLENOID "O-TYPE" VALVES for pressures up to 125 psi. Widely used as pilot valves and for operating air cylinders.

Quick-As-Wink
AIR AND HYDRAULIC
Control Valves

Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

Mfd. by C. B. HUNT & SON, INC., 1995 East Pershing St., Salem, Ohio

Circle 71 on Reader Service Card

"EMSCO is the practical answer to swivel joint problems"

When you buy a swing joint you buy two main benefits: Ease of turning and a good method of packing against leakage. Emsco offers you both.

With Emsco, load on the ball bearings is parallel to the lines of force and directly through center of the balls, thus reducing frictional torque for free turning under heavy loads. A patented packing and packing chamber design with easy take-up feature provides effective sealing against leakage; prolongs life of the joint indefinitely.

Emsco Swivel Fittings are manufactured in popular sizes for practically every type of service; from high vacuum to pressures of 15,000 p.s.i., and from sub-zero temperatures to 750° F. Simply tell us your application and type of end connections required.

When you buy a swing joint, specify Emsco.

THRUST BEARINGS FOR THRUST LOADS

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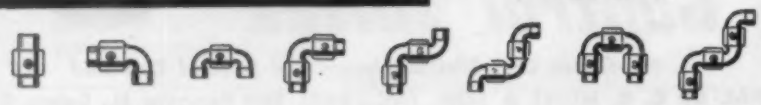
Box 2098, TERMINAL ANNEX
LOS ANGELES 54, CALIF.
Houston, Texas
Garland, Texas



New Products / continued

tures range from —65° to 300°F.

Design: The lightweight inner tube permits production of a 24-inch hose assembly weighing 1.22 lb and having a minimum bend radius of 5½ inches. The new hose is completely unaffected by all synthetic fuels and oils.

Resistoflex Corp.
Belleville, N. J.

Circle 282 on Reader Service Card

BACK PRESSURE VALVE . . . for 0 to 400 psi

Designation: Type FR

Design: Valve has "floating ring" element to completely compensate for any misalignments and to produce perfect seat contact. Floating ring moves freely in any lateral direction for perfect alignment with the sperical seat disc. Valve eliminates friction caused by drag of a piston and cylinder found in other valves.

Features: Valve is packless and has simple pressure adjustment. All

parts are renewable without removing valve from line. Cap over adjusting screw makes a tight seal in case of diaphragm failure and prevents tampering with valve adjustment.

Specifications: Made in pipe sizes from ½ to 2 inches in iron, bronze, stainless steel, or monel body. Suitable for pressures to 400 psi.

Applications: Used to maintain a preset pressure on the inlet side by relieving a lower pressure line. Substantially unaffected by pressure

Continued on page 142

Circle 26 on Reader Service Card

What he needs is a

STAFFA HYDRAULIC RAM!

Staffa Rams are available in four standard ranges: high and low pressure solid, high pressure hollow and tubby rams. Loads from 1 to 150 tons. Pressures up to 5,000 p.s.i., strokes up to 36". Higher pressure and larger stroke rams are made specially.

For rams, pumps and all other hydraulic equipment write to Chamberlain Industries Ltd. Staffa Works, Staffa Road, Leyton, London, E.10.

Staffa PRODUCTS

For pulling, pushing, lifting, pressing, clamping, bending or spreading.

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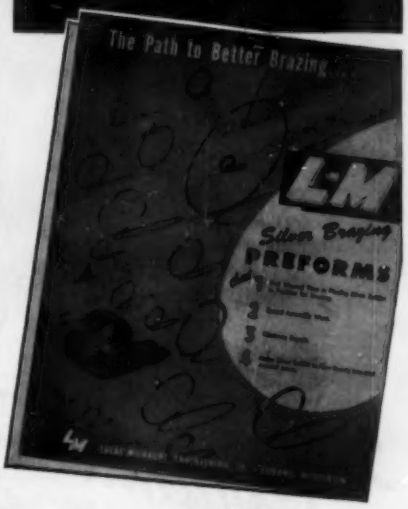
IF Silver Brazing IS PART OF YOUR PRODUCTION

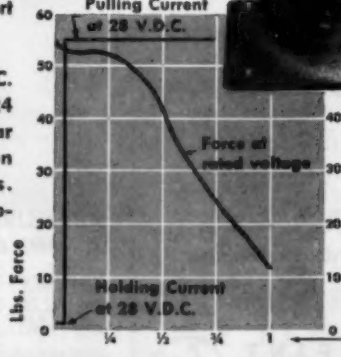


Decco DUAL WOUND D. C. SOLENOIDS

Compact Efficient Powerful

Because of its "Dual wound" construction the new Decco Series 29 D. C. Solenoid is able to deliver tremendous force in small space in continuous service. See Force Stroke Chart below.

This compact, new D.C. Solenoid is available in 24 to 250 Volt range, regular or waterproof construction —J.I.C. Specifications. Ideal for mobile equipment.



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- **Gives you complete information on No Tangle-Notch Coil Rings, how they increase production, save time and labor in handling alloy.**
- **Helps you select the proper preform for the job. Contains charts that illustrate the type joint, recommended preform and simple ordering data.**
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- **Helps you get quick, accurate alloy calculation with calculating tables for all commonly used alloys.**

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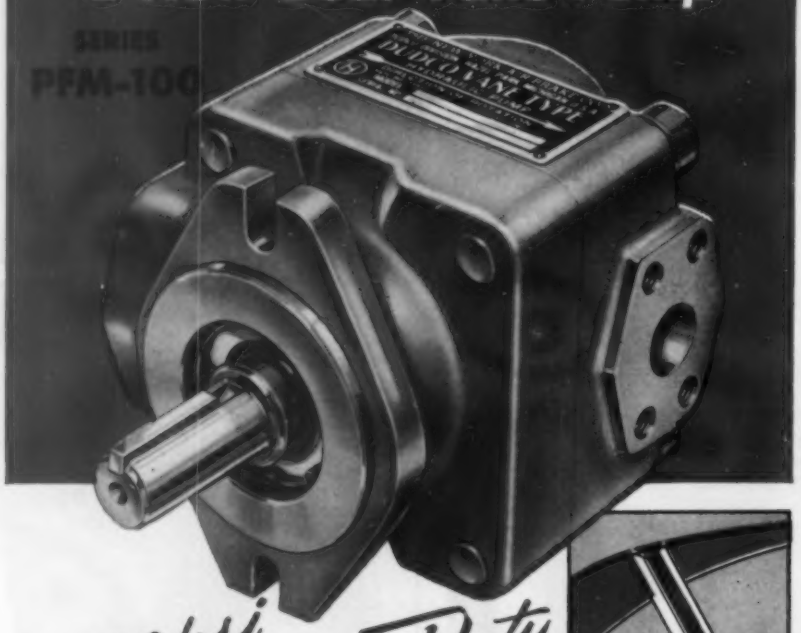
5052 S. LAKE DRIVE, CUDAHY, WIS.

DUDCO PRESENTS . . .
for MOBILE EQUIPMENT
a New Dual-Vane Pump



2000 psi Continuous Duty
3 to 11 gpm at 1200 rpm 0 psi

TWO VANES ARE BETTER THAN ONE

The hydraulically counterbalanced DUAL-VANES in DUDCO Hydraulic Pumps eliminate wear producing loads normally caused by unbalanced hydraulic forces and vane acceleration. DUAL-VANES also maintain MULTIPLE SEALING BARRIERS to slippage and power loss. DUAL-VANES are a patented and exclusive DUDCO feature.

This Pump was engineered to meet the special conditions characteristic of service on mobile equipment.

Here is a pump designed for high speed direct engine drive that can be operated *continuously* at *2000* psi and *2000* rpm to meet the continuing demand for more work from your equipment.

The exclusive DUDCO Dual-Vane design provides and assures *complete hydraulic balance* of all internal parts. Bearing loads and cam ring wear are reduced so DUDCO PFM-100 Pumps last longer.

Designing these Pumps into your machines is made easier because all standard S.A.E. or industrial mountings and piping provisions are available, as well as complete flexibility of port positions.

PFM-100 Series Pumps are priced for the competitive mobile equipment market . . . NO price penalty for high pressure equipment.

Write — for complete information on the new DUDCO PFM-100 Series DUAL-VANE Hydraulic Pump.

DUDCO DIVISION
THE NEW YORK AIR BRAKE COMPANY
1104 EAST 222nd STREET • CLEVELAND 17 • OHIO
INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.

New Products continued

variations on the discharge side. Provides protection against periodic high pressure conditions. May be modified for use as differential pressure regulator to hold a constant difference in pressure between valve inlet and outlet.

A. W. Cash Valve Mfg. Corp.
Decatur, Illinois

Circle 283 on Reader Service Card

AIR FILTER
. . . for 40-micron particles

Designation: Model F-1

Features: Filter has unique center-bolt construction for easy removal of the filtering element. Cleaning of the element is quickly accomplished by washing in gasoline, kerosene, or almost any other solvent.

Design: Filtering element is phenolic resin-impregnated cellulose cylinder capable of removing dirt particles as small as 40 microns. Unit has all brass construction with ¼-inch N.P.T. connections and is available with a wall-mounting bracket.

Conoflow Corp.
Philadelphia, Pa.

Circle 284 on Reader Service Card

ABRASIVE TUBE CUTTER
. . . with deburring attachment

Features: In addition to having an abrasive cutter capable of making square, accurate cuts with a minimum burr, unit has deburring wire wheels mounted on special shaft of motor. Cut tube is inserted into the opening in the wire wheel

housing, rotated half a turn, and in less than two seconds a burnished end is produced. Cutting capacity of the unit is 1½-inch tubing, 1-inch standard pipe, 1-inch solid bars, and 2-inch structural shapes.

The hand-operated, work-holding device is cam operated and can be quickly adjusted to hold the material on both sides of the wheel.

Applications: For use where finish, and squareness are important such as hydraulic tubes fitted with sleeves and tubes requiring further fabrication.

Wallace Tube Co.
Chicago, Illinois

Circle 285 on Reader Service Card

SOLENOID LIFT VALVE . . . for higher pressure

Designation: Type F (brass) Type G (stainless steel)

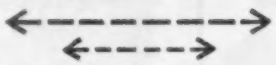
Features: Valve has renewable

metal seat and interchangeable coil and is designed for 1000 psi air and 500 psi oil. Available in ⅛ and ¼-inch pipe sizes with ports from 1/16 to ¼ inch.

J. D. Gould Co.
Indianapolis, Ind.

Circle 286 on Reader Service Card

HYDRECO Oil Power OFFERS ENGINEERS- CUSTOM DESIGN in HYDRAULIC CYLINDERS!



Even simple functions may entail special configurations to give maximum results...

Or, when the function involves motion in more than one direction, custom design develops mountings to suit the application...

Or cylinder movement in any direction, and many other variables are yours with HYDRECO Custom Design.

For the engineer whose target is equipment that will outperform any comparable unit—the special facilities offered by HYDRECO can materially assist in attaining the objective. Not with so-called "standard" cylinders but rather with cylinders custom engineered and built to do the specific job.

Requirements of space, mounting, or hydraulic connections that could never be met by "standard" cylinders, can be fulfilled easily through custom designing.

And too, HYDRECO's variety of experience in designing and building special hydraulic components in volume production can keep the product costs within the budget.

That which is true of HYDRECO Cylinders is equally true of HYDRECO Pumps, Motors and Valves. To improve the performance of existing equipment or to add functions *and* complete dependability to projected designs—look to HYDRECO Oil Power!

WRITE— *for full information today on HYDRECO Pumps, Motors, Valves and Custom Built Cylinders.*

HYDRECO DIVISION
THE NEW YORK AIR BRAKE COMPANY

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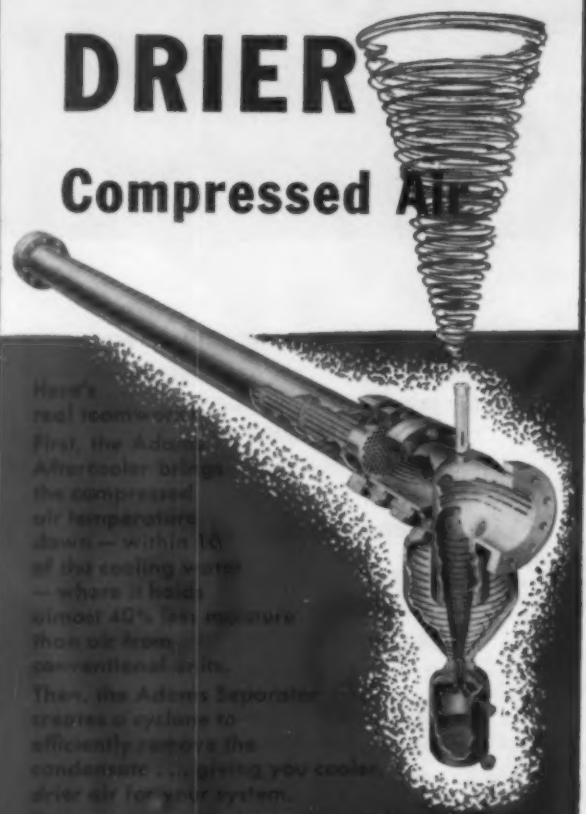
Circle 75 on Reader Service Card

We create a CYCLONE to give you DRIER Compressed Air



Here's real teamwork... First, the Adams Aftercooler brings the compressed air temperature down—within 10° of the cooling water—where it holds almost 40% less moisture than air from conventional units. Then, the Adams Separator creates a cyclone to efficiently remove the condensate . . . giving you cooler, drier air for your system. Thousands in use throughout industry should pay you to find out all the details. Mail the coupon below today.

R. P. ADAMS CO., Inc.

Buffalo 17, New York

R. P. ADAMS CO., INC.

Buffalo 17, N. Y.
249 East Park Drive

MA-55

Please send my FREE copy of Bulletin #711 on Adams Cyclone Separators and Aftercoolers.

Name..... Firm.....

Street..... City..... State.....

Useful Literature / continued

SEALED ROLLER BEARINGS . . . with molded synthetic rubber seals which are bonded to the metal case are specified in Bulletin SF-82 of the Roller Bearing Co. of America. The springless seals can retain lubricant and exclude dirt. The bearings have flanges which furnish positive, square seats for the seals and separate the seals from revolving parts. Space is provided between rollers for lubricant reservoirs assuring cool operation for long life of seal and bearing. Bearings are furnished with or without inner races.

Circle 184 on Reader Service Card

LEAKPROOF LOCKWASHER . . . manufactured by Dowty Seals Ltd. is a star-type metal lock washer molded into a rubber sheath. Used under a screw head, the blades of the washer pierce the rubber and provide the necessary locking action. The rubber fills the scores made by the blades and forms a seal against dirt, dust, moisture, or fumes. A complete description of the device is given in a booklet from the company.

Circle 185 on Reader Service Card

MACHINE MOUNTS . . . that absorb shock and vibration and eliminate construction of special foundations are described in Bulletin 546 from Barry Controls, Inc. The spring mount for high speed, high impact applications and the leveling mount for less severe applications are illustrated on several different machines including a vertical milling machine, horizontal boring mill, and universal hydraulic grinder. Using the mounts, machines can be installed and leveled in minutes and can be easily moved from one location to another. Because the mounts absorb the shock and vibration that affect machine settings, continual adjustment of the machine is eliminated.

Circle 186 on Reader Service Card

VALVES AND CYLINDERS . . . manufactured by Galland-Henning Nopak Div. are detailed in their Bulletin SW-3. The cylinders are classified according to their construction of brass tubing and tie-rod, recessed head, mill type, square head tie-rod, and lock-ring flange types. The bulletin also features hand operated valves for air and hydraulic service, pneumatic-hydraulic, foot-operated valves, and solenoid operated valves.

Circle 187 on Reader Service Card

HOSE AND FITTINGS . . . manufactured by The Weatherhead Co. are cataloged in a 132-page manual designated as Catalog C-100. This material containing valuable information for designers of hydraulic and pneumatic systems is arranged with tabbed pages indicating separate sections covering brass tube fittings, drain and shut-off cocks, SAE 37-degree flare (J.I.C.) fittings, flareless steel and stainless steel fittings, bulk hose and reusable ends, and hose assemblies with reusable or permanently-attached ends.

Continued on page 146

Circle 154 on Reader Service Card

WIGGINS
INST-O-MATIC
COUPLINGS

Manual Quick Disconnect (Push-Pull Positive Action)

Automatic Quick Disconnect (Breaks Away at Pre-determined Weight Load)

QUICK-DISCONNECT
3000 psi

for Low or High Pressure
HYDRAULIC FUEL
and
PNEUMATIC systems

SIZES: ¼" TO 2½"

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NEW POCKET MANUAL OF ARC WELDING
AT A NEW LOW PRICE

For Welding Supervisors and Foremen:

Latest welding application data. Revised, pocket-size manual is a concise source of information for those responsible for maintenance and production welding operations.

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An easy-to-read reference book that provides practical on-the-spot answers to many arc welding problems—172 pages of necessary working information that can be used in everyday shop work.

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Please send me —— copies of the POCKET MANUAL OF ARC WELDING at $1.00 each.

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Circle 131 on Reader Service Card

PROTECT
EXPENSIVE GAGES

SPRAGUE SHUT OFF VALVES automatically cut out gages and other pressure-sensitive instruments when fluid pressures go beyond their operating limits. Automatically open when pressure is again within approx. 80% of set cut-out points. Available for any pressure setting between 10 PSI. and 5000 PSI. Save valuable man hours. Eliminate opening and closing manually operated shut off valves. Supplied with standard pipe thread connections, also available with AN tube fittings. Body is 1⅛" aluminum hexagon stock. Length 5½". Bronze or stainless steel bodies also available. Easy to install. Thousands in use. Write for bulletin.

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DESIGNED FOR THE JOB

FLOOR SPACE: 48"x54"

50 TON DUAL RAM
SPECIAL ASSEMBLY PRESS
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Featuring . . . Manual control of tonnage and rapid ram travel

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IN THE *New* BARKSDALE 9612 PRESSURE SWITCH

THESE FEATURES HAVE BEEN ADDED	WE DON'T USE
LONG, LONG SERVICE LIFE They last MILLIONS of cycles without maintenance because of simplicity & rugged construction.	**UNSEALED PISTONS** which makes pressure switch critical to dirt.
PROOF PRESSURES TO 7000 P.S.I. and actuation as low as 15 P.S.I.	**ACCORDION DIAPHRAGMS** which makes pressure switch critical to vibration.
± 2% REPEAT ACCURACY because of honed piston bore and direct switch action.	**LINKAGES and BEARINGS** which, as they wear, cause settings to drift.
OPERATE IN ANY POSITION and are less expensive to install, because only one pipe is needed —since the piston is sealed there is no drainpipe as on unsealed pistons.	**LIQUID SWITCHING ELEMENTS** which requires that the pressure switch be mounted absolutely vertical, and makes it very critical to vibration.

BARKSDALE VALVES

PRESSURE SWITCH DIVISION
5125 Alcoa Avenue, Los Angeles 58, California

Send Complete 9612 Literature and Operating Data

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COMPANY _____

ADDRESS _____

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Useful Literature

continued

The technical data section contains pressure tables, tube-bending instructions, correct procedures for making hose assemblies, hose end hex sizes, tubing safety factors, tube wall thickness tables, and other useful data. A section covering service tools and equipment is also included.

Circle 188 on Reader Service Card

HYDRAULIC CYLINDERS . . . for operation at 2000 psi and higher are detailed in Miller Fluid Power Co.'s Bulletin H104K which replaces their Bulletin H104G. The cylinders range from 1½ to 12-inch bores and have strokes up to 22 feet. Nineteen different mounting styles are available. The bulletin provides convenient design and operational data for the cylinders which include the new extra-sturdy Model 77. Information on the new piston-seal assembly of the precision seal cylinder, and high temperature operation is presented.

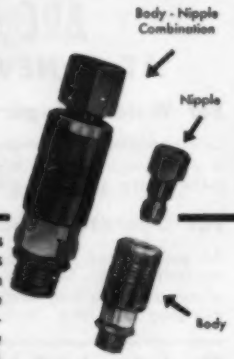
Circle 189 on Reader Service Card

STAINLESS STEEL FILTERS . . . are featured in Bulletin 213 released by Micro Metallic Corp. In addition to the stock filters which are available on a 24-hour shipment basis, the bulletin permits the complete specification of non-stock filters in standard

ARE YOUR AIR LINES LAZY?

GET MORE AIR FROM THEM WITH

TRU-FLATE QUICK COUPLERS



Longer wearing—More air—Less pressure drop—All working parts case hardened steel. Available in the regular Tru-Flate design or the Interchange Series, (interchangeable with couplers produced by the Hansen-Foster companies.)

- **Sleeve type couplers in sizes ⅛" to 1".**
- **Push type couplers in sizes ⅛" to ¾".**
- **High pressure couplers in sizes ½" to 1".**
- **Hydraulic couplers in sizes ⅛" to 1".**

QUICK COUPLERS ALSO AVAILABLE FOR—
STEAM • OXYGEN • ACETYLENE • SOLVENTS

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Circle 14 on Reader Service Card

Circle 141 on Reader Service Card

designs to comply with particular gas or liquid filtration requirements. Choice of filter area, porosity of stainless steel filter elements, pressure ranges, pipe fittings, and element spacing is provided. Standard design filters for pressures to 10,000 psi are described, and recommendations for filter use and specific applications are included.

Circle 190 on Reader Service Card

TEFLON ARTICLES . . . produced by Sparta Manufacturing Co. are reviewed in a brochure. Pictured are numerous products typical of the many types available. The excellent electrical and sealing features of Teflon combined with its wide temperature range, inertness to nearly all chemicals, low coefficient of friction, and non-adhesive qualities give it wide applications in difficult sealing problems. A chart giving many of the properties of Teflon is included in the brochure.

Circle 191 on Reader Service Card

PRESSURE REDUCING VALVES . . . for liquids and gases are presented in catalog sheets available from Foster Engineering Co. The Y-type valves are built for initial pressures as high as 3000 psi maximum and reduced pressures ranging from several ounces to 250 psi. These valves are unusually sensitive to slight variations in reduced pressure, insuring close regulation. The U-type valves are primarily for water and air service, but may be used for non-corrosive liquids and gases of moderate to low pressures and temperatures. Complete performance specifications and colored cut-away drawings are shown.

Circle 192 on Reader Service Card

NEEDLE VALVES . . . available from The Carpenter Valves Corp. are outlined in a 4-page folder. Included are various types with prices indicated according to material used for the valve.

Circle 193 on Reader Service Card

AIR POWER SYSTEMS . . . is the subject of a new engineering service bulletin titled "A Better Air Power System". Prepared by Ingersoll-Rand Co. the bulletin indicates that power losses in compressed air lines are frequently as much as 30% to 50% and it describes the procedure of determining whether the waste of air is more expensive than the repair and renovation of the distribution system. The step-by-step procedure for bringing the system up to accepted standards is then given. The booklet is also helpful in the design of new systems and contains diagrams of different types of piping networks and tables of air friction losses in pipe, fittings, and hose.

Circle 194 on Reader Service Card

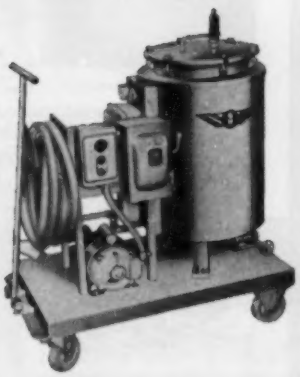
QUAD RING SEALS . . . products of Minnesota Rubber and Gasket Co. are the subject of an insert pamphlet for the company's Engineering Book 10A. The pamphlet demonstrates the principle of this unique seal and gives six case histories of its uses. These applications include an electron microscope,

Continued on next page

clean oils... are safe oils

protect your hydraulic equipment

with this



PORTABLE

HOFFMAN FILTER

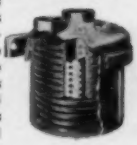
This HOFFMAN PORTABLE CARTRIDGE FILTER helps keep your hydraulic machinery and equipment running at peak efficiency . . . anywhere in your plant.

The free-moving HOFFMAN CARTRIDGE FILTER prevents hydraulic machinery shut-downs due to dirty oils . . . banishes sticky valves . . . prevents component failure. It hooks into the oil system without interrupting machine operation for a fast thorough filtering job to eliminate acids, gums, resins, sludge, dirt and other insolubles.

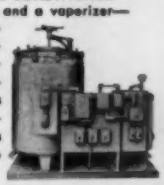
Initial cost and upkeep are so low that savings in oil and reduced machine downtime let you write off initial investment in a hurry.

Built in 30 and 60 GPH capacities with repackable or throw-away cartridges—especially useful where continuous filtration is not needed.

HOFFMAN DISC FILTER, especially suited for continuous filtration where space is limited and initial cost is a prime factor. Designed to operate at pressures up to 50 lbs. Flow rates from 1 to 125 GPM; removes particles as small as 5 microns.



The HOFFMAN OIL CONDITIONER—combining a filter and a vaporizer—provides continuous, complete conditioning of contaminated hydraulic oils. All solids and solubles removed. Capacities range from 25 to 600 GPH.



Consult HOFFMAN Filtration Engineers about your maintenance problems in oil and other fluids.

Mail this coupon for specific information on the various types of HOFFMAN INDUSTRIAL FILTRATION EQUIPMENT.

INDUSTRIAL FILTRATION DIVISION

U.S. HOFFMAN MACHINERY CORP.

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___ Vacuum Filters
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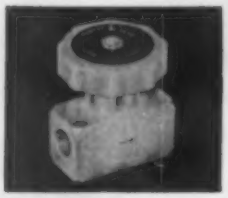
a manual
SHUT-OFF VALVE
that doesn't leak!



- "O" Ring seal for dead tight shutoff
- 416 Stainless barstock body
- Liquid or gas service to 3000 psi
- Design permits throttling

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CIRCLE SEAL VALVES PROVIDE the ultimate in quality, providing perfect sealing—maintenance-free operation.

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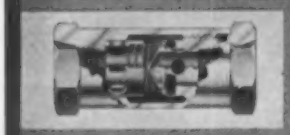
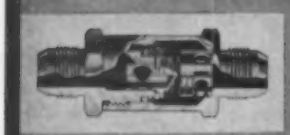


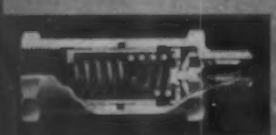
100 Series Check Valve. Ultra-sensitive for very low pressure gas systems. ☐



200 Series Check Valve. Low pressure pneumatic, hydraulic or oil—high pressure pneumatic service. ☐

2300 Series Check Valve. Air, oil or hydraulic service to 10,000 psi. ☐

500 Series Popoff Relief Valve. Precise over-pressure protection for gas service to 140 psi. ☐



5100 Series Relief Valve. In-line design. Gas or liquid to 1000 psi. ☐

CIRCLE SEAL *precision valves*

Representatives in Principal Cities.

JAMES•POND•CLARK

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Useful Literature

continued

vacuum pump, and a flow control valve. Design information is given to show the recommended squeeze for a moving seal. This is less than O-ring requirements, yet gives a perfect seal with less break-away and drag friction which increases life and reduces the chances of extrusion. For some installations the Quad Rings are good replacements for V-ring and U-ring packings.

Circle 195 on Reader Service Card

FLOW INDICATORS . . . are described and illustrated in Data Unit No. 253 prepared by Jerguson Gage & Valve Co. The material gives information and specifications on their line of transparent and reflex sight flow indicators for use on any pipe line ½ to 2-in. N.P.T. The indicators introduce turbulence into the line to show flow of the liquid. Several types of indicating vanes may also be furnished, according to variable conditions of rate of flow and viscosity of liquid. The indicators are for pressure ratings up to 3000 psi.

Circle 196 on Reader Service Card

HYDRAULIC CYLINDERS . . . meeting all J.I.C. requirements are featured in Bulletin No. 53 prepared by Hydro-Line Manufacturing Co. The cylinders are designed for 2000 psi service and have no tie rods or retainer rings. The bulletin specifies fixed-

FOR CLEAN, DRY AIR

Distributing Line Of Cool Air From Receiver Tank
Vapor Free Air Near Point Of Use
Take Off From Top Of Pipe
Replaceable Desiccant

MURPHY TRIUMPH AA SEPARATOR-FILTER
Sizes: ⅛, ⅜, ½, ¾; Weight 30 lbs; Pressures: 0 to 125 psi; Price: $71.00 ea; Desiccant refills $1.00 ea.

After precooling and separating compressed air, this small unit, placed close to the point of use will finish the job of removing last traces of impurities.

Where very particular work demands dry air completely free from any trace of oil or vapors Murphy Triumph AA is the answer.

AFTERCOOLERS FOR 10 CFM TO 10,000 CFM—SEPARATORS—TRAPS

JAS. A. MURPHY & CO. INC.

Hamilton, Ohio

Circle 79 on Reader Service Card

Circle 105 on Reader Service Card

foot, rotatable foot-mount, front flange-mounted, rear flange-mounted, clevis mounted, and trunnion mounted cylinders as well as the basic cylinder which can be modified for special mounting. Modifications are available for severe service with adjustable cushions to reduce piston impact. Other modifications include port relocation, addition of bleeders for venting, and hardened chromium-plated rods to resist scoring.

Circle 197 on Reader Service Card

HOSE . . . assemblies, couplings, stems, swivels, and accessories are shown in Catalog No. 55 from J. N. Fauver Co. The booklet contains a complete description of hose assemblies which are available in any length, complete with attached couplings, in hose sizes from 3/16 to 2-in ID. Extensive temperature and pressure ranges are offered with a wide variety of thread combinations. The assemblies are divided into those with permanent couplings and those with re-usable couplings. The permanent coupling assembly must be fabricated with special dies and presses. The re-usable coupling may be attached to the hose in the field without special equipment.

Circle 198 on Reader Service Card

HOLDING VALVE . . . for applications where intermittent pressure and pressure release are needed is included in a brochure from Sprague Engineering Corp. The valve automatically bleeds pressures in high pressure fluid systems and provides fast action with controlled flow to prevent the system fluid from foaming or surging. Other products manufactured by

Continued on next page

CLAMP YOUR WORK *HYDRAULICALLY!*

This folder shows how to SLASH ASSEMBLY TIMES

Simple • Inexpensive Instantaneous for

MILLING • GRINDING
WELDING • GLUEING
and every Clamping Problem

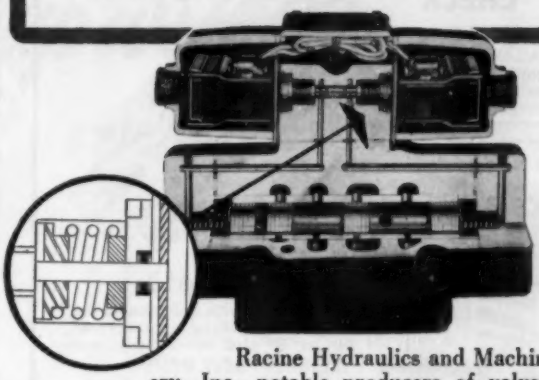
A NEWTON PRODUCT

POWER JACKS LIMITED
VALETTA RD. · ACTON · LONDON · W.3

1060

Circle 116 on Reader Service Card

RACINE HYDRAULICS
"SOLVES SEALING PROBLEMS"
BY DESIGNING-IN
PALMETTO G-T RING®



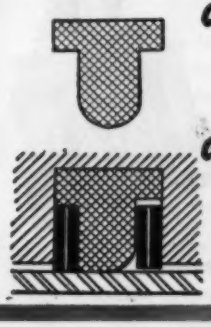
Racine Hydraulics and Machinery, Inc.—notable producers of valves, boosters, pumps and pumping units—recently introduced their Twin Solenoid Pilot Operated 4-Way Valve. For the dynamic seal operating at working pressures to 2,000 psi Racine selected the Palmetto G-T Ring. Read why:

"We have solved our sealing problems since Palmetto G-T Ring was first designed into our valve line two years ago. This was a very definite improvement over the former seals which had given various forms of trouble. The G-T Ring provided a good seal that did not roll, twist nor extrude into the clearance spaces.

There is a minimum of friction in the Racine "Twin" Solenoid Valve. The G-T 3/16" diameter seal allows dependable delivery of solenoid power to the pilot spool each time a solenoid is energized. No noticeable change of seal friction is experienced, regardless of whether the solenoids are on occasional or high cycling circuits."

This successful application further illustrates the versatility of the G-T Ring. For your applications—static or dynamic—involving pressures to 20,000 psi, try the G-T Ring. It will give *you* definite improvement, too!

INVESTIGATE THE MANY DESIGN ADVANTAGES OF PALMETTO G-T RING PACKINGS.



CANNOT SPIRAL . . .
The Palmetto G-T Ring will not twist and turn in the groove. "T"-form prevents leakage—reduces static and dynamic friction.

CANNOT EXTRUDE . . .
Resilient "T"-section supported by non-extrusion rings on either side makes extrusion impossible. As pressure is applied non-extrusion rings are urged against wall, blocking path of extrusion.

Write for our Manual MP-200, Engineering Standards for Palmetto Molded Packings. Consult Green, Tweed's engineering department...Qualified assistance yours for the asking!

PALMETTO Packings

packing more performance into every application

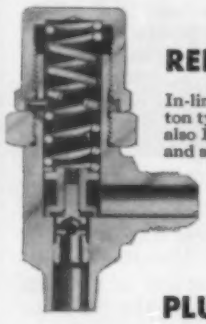
GREENE, TWEED & CO. North Wales, Pa.

Circle 61 on Reader Service Card

REPUBLIC
VALVES
INDUSTRIAL • CHEMICAL • AIRCRAFT

CHECK

Quality Check Valves of several types—ball, poppet, Hy-pressure, Free-flow—all metals, various portings, and pressures up to 3000 psi. Pipe and tube sizes up to 1".

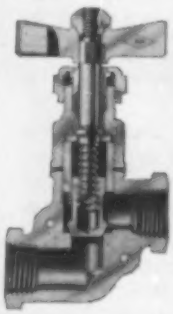


RELIEF

In-line and guided piston type Relief Valves, also Pilot Operated, with quick unloading and silent operation. Metal or rubber seal. ⅛" to ¼" pipe or tube port connections. Various metals.

PLUG

Precision-made Plug Valves for wide general use in brass, aluminum alloy, or stainless steel, ¼" to 1", +32° to 160°F. With Teflon plug, −65° to 250°F, without lubrication. Aluminum alloy or stainless steel.



GLOBE AND NEEDLE

Super duty shut-off valves, angle and offset, for up to 3000 service, ⅛" to 1". Also high pressure Needle Valves for 10,000 psi. working pressure—proofed at 25,000 psi. One piece, stainless steel, ⅛" to ½", Teflon packing.

LO-TORQ SELECTOR

Directional flow control for service up to 6000 psi. Balancing principle uses line pressure to make turning easy with short handle. 2, 3, 4-way, with various drillings. Side, bottom, and sub-plate porting. Panel mounting.

Ask for new catalog, No. 654, showing entire line.

Distributors in principal cities coast to coast.

RM REPUBLIC MANUFACTURING CO.
15655 BROOKPARK ROAD • CLEVELAND 11, OHIO

Useful Literature / continued

the company such as boosters, filters, accumulators, and pulsation dampeners which reduce vibration and shock in a hydraulic system are presented in the brochure.

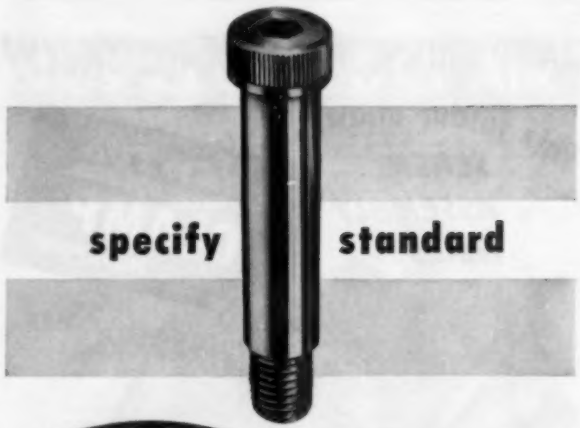
Circle 199 on Reader Service Card

REDUCING FRICTION AND WEAR . . . "Electrolizing . . . How It Increases Life and Efficiency of Parts Subjected to Wear, Abrasion, and Corrosion" is the title of a 16-page booklet issued by the Electrolizing Corp. The booklet discusses the electrolizing process of relieving stresses in a metal part and then depositing an extremely hard, dense, non-magnetic alloy on wearing surfaces. Electrolizing can be applied to all steels and most non-ferrous metals. Coefficient of friction is reduced as much as 50% and wear life is extended 2 to 10 times.

Circle 200 on Reader Service Card

OIL FILTERS . . . together with design considerations and recommendations for their use are contained in a bulletin from The Hilliard Corp. The bulletin outlines methods of installation and operation with recommendations of the proper filter for various hydraulic sump capacities. Many applications of the filters are suggested and several are illustrated.

Circle 201 on Reader Service Card



UNBRAKO SHOULDER SCREWS

Use them in tool and die work. Use them in assembly. These heat-treated alloy steel screws have knurled heads for sure finger grip and fast assembly; accurate hex sockets for positive nonslip internal wrenching. Shoulders are held to extremely fine tolerances, and finished threads run close up for maximum holding power. Standard sizes—¼" to ¾" in a full range of body lengths—are stocked by authorized industrial distributors. Write for Bulletin 877. STANDARD PRESSED STEEL CO., Jenkintown 2, Pa.

UNBRAKO SOCKET SCREW DIVISION SPS
JENKINTOWN PENNSYLVANIA

Circle 121 on Reader Service Card

Circle 133 on Reader Service Card

SOLENOID VALVES . . . are the subject of a complete general catalog published by the Skinner Electric Valve Div., Skinner Chuck Co. The new catalog describes the five basic valves and discusses the thousands of possible variations. It also explains how to choose the correct valve for various applications. The material is written in non-technical language and is illustrated with photographs and charts. A price list is included and cross-indexed for quick reference.

Circle 202 on Reader Service Card

FLOW METERS . . . are the subject of Bulletin 130 recently published by Brooks Rotameter Co. The bulletin describes applications and gives specifications on the company's products for high pressure and temperature fluid flow measurement and control. Included is the new flow meter which incorporates a non-magnetic metal extension tube instead of the customary glass tube. The magnetized float inside the tube moves an indicating sleeve outside the extension. This virtually eliminates friction. Because of the special end seals, non O-rings or rubber packings are required. This eliminates many maintenance problems, permitting simplified disassembly.

Circle 203 on Reader Service Card

ELECTRONIC TIMERS . . . A 5-page brochure with current information describing the standard line of electronic timers manufactured by G. C. Wilson & Co. is now available. Included in this line are delay, repeat cycle, and interval timers all of which are available from stock.

Circle 204 on Reader Service Card

HYDRAULIC STEERING DEVICE . . . for tractors is presented in a brochure from Lion Products Co. The equipment which requires only 35 to 40 minutes for installation removes the shock and steering effort from the driver. The brochure illustrates the simple device and shows it installed on several different makes and types of tractors.

Circle 205 on Reader Service Card

AIRCRAFT PUMPS . . . are included in the new Aviation Products Catalogue offered by Eastern Industries, Inc. Complete engineering data covering performance and operation temperature ranges, weights and sizes of all models are given with appropriate performance curves. The 1700 series pumps described in the catalogue are very small, light units for delivering a small, accurate volume against high pressure at high speeds. Displacements in this series range from .00419 to .02514 cu. in per rev. These pumps can be driven at speeds up to 10,000 rpm.

Circle 206 on Reader Service Card

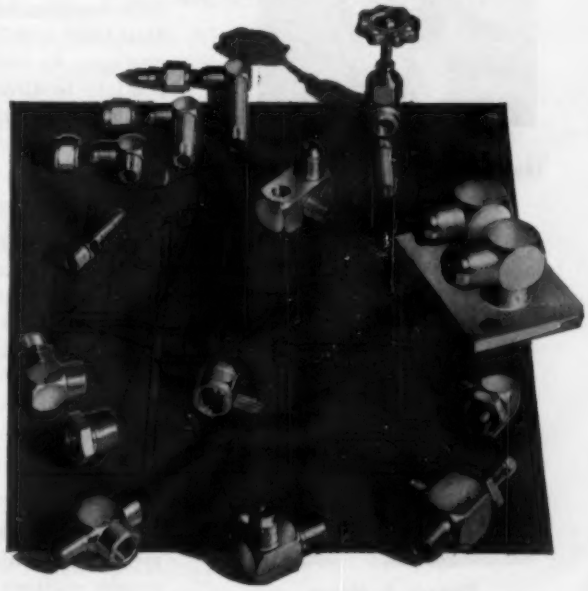
AUTOMATIC DRILL . . . manufactured by Drillmation Co. is described in their literature. The unit has a variable delivery hydraulic pump, and hydraulic thrust is applied directly behind the spindle, eliminating deflection and assuring smoothness of feed on heavy operations. A cool-running unit is assured because the hydraulic pump delivers only the volume of oil necessary at the pressure required to overcome machining resistance. Rapid approach and return are accomplished by a built-in air cylinder which is controlled by a solenoid air valve.

Circle 207 on Reader Service Card

Connect up with L and L

The Complete Line of Steel Fluid Power Couplings

JIC Flare Tube — Pipe Threaded
Flare Tube — Straight Thread "O" Ring
Flange Mounted — "O" Ring Seal



A—JIC Flare Tube Fittings
B—Manifold Fitting
C—Needle Valve
D—Pipe Nipple
E—Flange Manifold
F—Straight Thread, "O" Ring Seal Fitting
G—Ball Check Valve
H—Lateral Outlet Fitting
I—Universal Elbow
J—Dryseal Pipe Fitting
K—Hex Reducing Bushing
L—Swivel Elbow
M—Barbed Hose Stem

You can depend on L & L's quality, availability, and selection of steel couplings for piping all industrial hydraulic circuits.

Distributors in principal cities
Write for catalog No. 53

L and L MANUFACTURING COMPANY
8088 E. Nine Mile Rd., Van Dyke, Mich.

Circle 86 on Reader Service Card

Post Scripts of Industry

News about people, manufacturers and sales organizations

J. B. Sewell
The Garlock Packing Company

Richard R. Mease
Parker Appliance Company

William R. Beckerle
Weston Hydraulics, Ltd.

Election of **J. B. Sewell** as a vice president of **The Garlock Packing Company** has been announced. Sewell started with The Garlock Packing Company of Canada, Ltd., in 1935, became a vice president of the company with headquarters in Montreal and in 1954 was transferred to the United States and appointed general sales manager. As vice president he will continue to direct sales operations in the United States and Canada.

Richard R. Mease has been promoted by **Parker Appliance Company** to sales engineer, specializing on hydraulics, to the northern Illinois territory. Mease, who joined Parker in 1948, will work under the direction of Chicago district manager E. G. Durfee.

Weston Hydraulics, Ltd., has appointed **William R. Beckerle** as sales engineer covering the Eastern territory, which will cover the area east of the Mississippi River.

Due to increased business, three regional offices of **Minnesota Rubber and Gasket Company** have moved into larger, modern quarters. The Detroit office, directed by William Narcum is at 19149 Grand River Avenue; the Philadelphia office, with Tom F. Muckenfuss in charge is at 8 Tanner Street, Haddonfield, N.J.; and the New York City office, managed by Richard G. Wells and Robert B. Wilson, is located at 8 Riverview Avenue, Rutherford, N. J.

Automatic Switch Company named the **Moorlane Company,** North Kansas City, Mo., as authorized distributor for Asco solenoid valves.

Petch Manufacturing Company and **R. C. Hupp** jointly announced the appointment of Petch as the exclusive sale outlet for the Hupp threadless subplates. Sales will be handled from the company's Detroit offices.

Robert J. Polacek has joined the sales development section of the Product Development Department of the Chemical Division of **Celanese Corporation of America.**

Floyd V. Snodgrass was elected vice president in charge of production of **Walworth Company.** He was previously works manager and assistant to vice president of the Pacific and Foundry Company's Renton, Seattle, plant.

Lawrence M. Krebs was appointed to sales engineering staff of the Nopak Division of the **Galland-Henning Mfg. Co.** He will serve as first assistant to Robert W.

Continued on page 154

Applied Hydraulics . . .

PRIZE PAPER CONTEST

You Have Until July 1st to Enter

Here's what you can win:

First Prize $500.00
Second Prize $300.00
Third Prize $200.00
Fourth through Seventh Prizes ea. $50.00

And in addition to cash awards:

Prize paper will receive national publicity. Major awards winners will be honored at the Eleventh Conference on Industrial Hydraulics at the La Salle Hotel, Chicago, October 27-28.

Anyone who uses, designs, builds or maintains pneumatic or hydraulic machines or equipment can enter this contest.

Papers will be judged by: William E. Adamek, Fisher Body Division, General Motors Corporation; David Hutchinson, Sundstrand Machine Tool Co.; Joseph F. Ziskal, International Harvester Co.

Your contest entry paper can describe:

A circuit design, a maintenance program, a safety circuit, the solution to a problem in speed, pressure or timing control, construction techniques, methods of component selection, testing procedures etc.

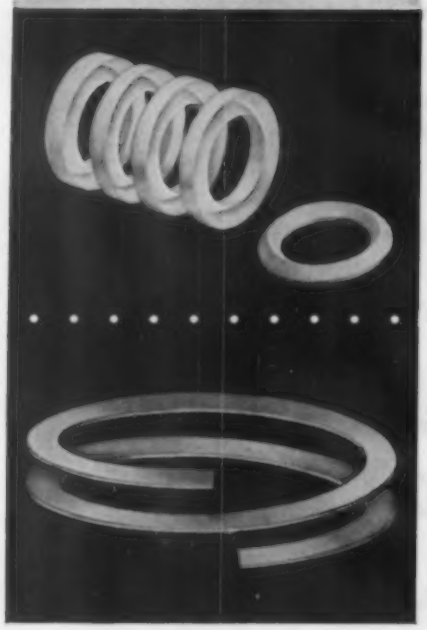
• ***Write today for your entry blank***

Applied Hydraulics Magazine

1240 ONTARIO STREET • CLEVELAND 13, OHIO

finest hydraulic packing for plane or plant...

Chemiseal hydraulic packings ... made of chemically impervious duPont TEFLON—have zero swelling in all hydrocarbons, new synthetic hydraulic fluids and solvents. Require no chemical inspection. Unsurpassed antifriction properties, are tough, resilient, non-flammable, long wearing. Wide service temperature range from minus 110°F to plus 500°F.



Chemiseal V-Type packings are ideal for either manual or automatically operated valves. Seal with low gland pressure and operating torque. Square end TEFLON adaptors are available if required. Catalog TP-1053.

Chemiseal Back-up rings prevent "O"-ring extrusion and greatly lengthen their life. Spiral, solid and split ring types are available in all commercial and AN sizes. Catalog OB-1152.

UNITED STATES GASKET COMPANY
CAMDEN 1, NEW JERSEY

USG

FABRICATORS OF FLUOROCARBONS & OTHER PLASTICS
Representatives in principal cities throughout the world

Post Scripts of Industry
continued

Peterman, sales manager, in field service and special engineering problems.

Floyd M. Bryant was named Iowa representative for **Moehlenpah Engineering, Inc.** He will cover all of Iowa and the Moline-Rock Island, Illinois territory for

Floyd M. Bryant
Moehlenpah Engineering, Inc.

both Moehlenpah and its affiliate Hydro-Air Engineering. **W. G. Bowman** will represent these two companies in southern Illinois and Evansville, Indiana.

Philip B. Keller has become vice president in charge of Engineering at **Stillman Rubber Company.** Keller, prior to joining Stillman, was head of the New Product Development Department of R. T. Collier Corp., where he also acted as patent counselor.

Jack D. Tolliver was appointed manager of the recently established Sales Development Division of Tube Turns. Tolliver joined the company in 1949, was assigned to the engineering service division and became assistant manager in 1954.

Two field engineers have been appointed to represent the Republic Rubber Division, **Lee Rubber and Tire Corporation. James W. Fullerton** will headquarter in

St. Louis, Missouri and **Robert A. Hopkins** will cover the Kansas City, Missouri, area.

Alfred L. Gregory was named district manager for the Cleveland office of the Automatic Door Division, **National Pneumatic Co., Inc.** He was previously associated as a district manager for the F. W. Dodge Corporation.

Char-Lynn Company recently appointed Geo. A. Kushman, **Geo. A. Kushman Co.,** Oakland, California as representative for the states of Arizona, California, Idaho, Nevada, Oregon and Washington. Geo. A. Kushman Co., has now appointed the following distributors for Char-Lynn products:

Geo. A. Kushman
Geo. A. Kushman Co.

Air-Draulic Co., Phoenix, Arizona; **Carl J. Kennedy Co.,** Glendale, California; **Power Transmission Engineering Corp.,** San Jose, California; **Russ Chamberlin Co.,** Portland, Oregon; **Spencer Aircraft Industries, Inc.,** Seattle, Washington and **Calkins Mfg. Co.,** Spokane, Washington.

Appointment of **Lester J. Henderson** as vice president of the newly formed Aviation Division of The Weatherhead Company, was announced by Albert J. Weatherhead, Jr., president. The new division is located in Antwerp, Ohio. Henderson joined the organization in 1935 and has served as assistant sales manager and production

Continued on next page

• PRECISION • WEIGHT-SAVING
• RE-USABLE HOSE FITTINGS

Designed for extra strength, free flow and light weight. Precision made in Aluminum or Steel. Wide range of sizes and types in standard designs carried in stock. Special designs made to your specifications. Write for FREE catalog or order through your dealer.

Dealerships Available In Some Areas.

STRATOFLEX

STRATOFLEX, INC. — FORT WORTH, TEXAS
P. O. BOX 10398

BRANCH PLANTS: LOS ANGELES and TORONTO
SALES OFFICES: ATLANTA — CHICAGO — DAYTON — HOUSTON — KANSAS CITY — NEW YORK — PORTLAND (ORE.) — TULSA
IN CANADA STRATOFLEX OF CANADA, INC. — TORONTO 18, ONTARIO

Circle 135 on Reader Service Card

Post Scripts of Industry
continued

manager. In this new capacity, he is responsible for the engineering, manufacturing and sale of all aviation products.

Hughes Aircraft Company appointed Alexander MacGillivray director of finance. He was previously associated for 18 years with the RCA-Victor Division.

Minneapolis-Honeywell Regulator Company and **Raytheon Manufacturing Company** have entered into a joint undertaking to engineer and market new large, highspeed electronic data-processing systems. The jointly owned corporation will be known as Datamatic Corporation.

O & M Machine Company, Inc., named **Paul E. Beattie** as vice president and general manager of the organization. Prior to joining O & M he was with Western Industrial Engineering.

National Motor Bearing Co., Inc., has assigned **Carl Wolff,** industrial sales engineer in southern California, to the Arizona territory in addition to his duties in California. He will headquarter at the company's Downey, California, plant.

Carl Wolff
National Motor Bearing Co., Inc.

Donald L. Archibald was appointed district sales manager in the New England area for **Joy Manufacturing Company.** With Joy since 1940, Archibald served as sales engineer in New York, Butte, and was at St. Louis until his recent transfer. He will headquarter in Boston.

The Hammel-Dahl Company has named the **Russell F. Clark Company,** Pittsburgh, as their new sales and service representative. They will cover western Pennsylvania and part of West Virginia.

Pneu-Hydraulics, Inc., formerly Industrial Products Division, Production Service Company,

new! ADVANCED ENGINEERING FEATURES

new! EXTRA-HIGH FLOW RATES

new! QUICK OPENING LIDS

announcing
A COMPLETE NEW LINE
OF HONAN-CRANE
OIL FILTERS
...the first in a series of important engineering developments by the NEW Corporation... HOUDAILLE-HERSHEY OF INDIANA, INC.

FULL FLOW—For in-line installation at high flow rates—25 to 800 GPM. Low pressure drop—only 4 PSI across unit at 170 SUS. Uses new "FLO-PAC" pleated paper cartridge permitting full flow of oil—removal of particles down to one micron.

MULTI-CARTRIDGE Eleven sizes to choose from with six different types of cartridge filter elements to give exact degree of filtration needed. New "FLO-PAC" and "KLEER-PAC" cartridges have large dirt holding capacities.

BULK REFILL—For absolutely clean oil—bulk Cranite filtering medium provides thorough depth type purification, removing all solids and products of oxidation in solution. Bulk or cartridge type cellulose refills available for fine filtering.

ALL MODELS HAVE QUICK-OPENING LIDS

Purifier lid is fastened with swing bolts which one man can loosen quickly. Lid swings back for easy access to refills.

Write for engineering bulletins and quotations on all three models.

HH
HOUDAILLE-HERSHEY OF INDIANA, INC.
FILTRATION DIVISION

102 WABASH AVENUE, LEBANON, INDIANA

have opened their office and warehouse at 5421 Fleet Avenue, Cleveland, Ohio. **Al Holden, Jim Carver,** and **Lee Parsson** are the sales engineers for the company.

Marsh Instrument & Valve Company (Canada) Ltd., opened their new manufacturing plant and sales office in Edmonton, Alberta. The new facilities were designed and equipped to give prompt and efficient service. **M. C. Minton** will be the resident manager and **Clyde Fisher** will head the manufacturing staff.

Edward A. G. Porter has been named a director of **Superior Tube Company.** Partner in a Philadelphia law firm, Porter is also a director of the Electric Tachometer Corp.

Edward A. G. Porter
Superior Tube Company

The Plessey Company Limited, Ilford, England, appointed **Thomas P. Collier,** Chicago, to be their sole and exclusive representative in the United States. Collier, who had considerable experience in international trade, will be responsible for liaison between American industry and Plessey and for the servicing of present and future licensing contracts.

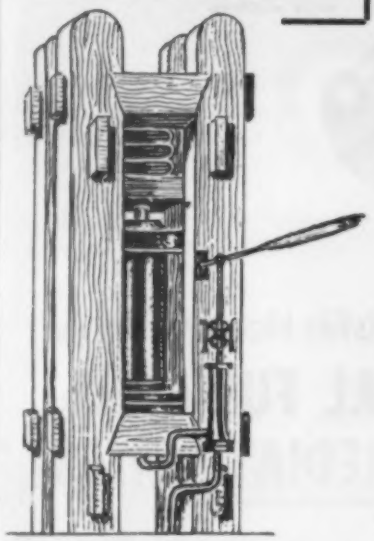
The Fibrous Products Division's Sales Department of the Union Asbestos & Rubber Company, has moved into their new office building adjacent to the Bloomington, Illinois, plant. The new modern structure will also house the division's production control and specifications department.

Continued on next page

CONTROLLED PRESSURE crimping process attaches FUL-BORE coupling permanently to single or double wire braid hose. This process assures longer life under extreme static and surge pressures.
No misfit Hose with
GENERAL FUL-BORE
INTERMEDIATE SIZES
■ With General's complete range of sizes, you need not accept a hose assembly that's "nearly right" for your application.
Flow requirements determine the hose size to be used. These intermediate sizes, pioneered by General, plus standard sizes, give you a wider selection to meet each specific flow requirement. This results in maximum performance and economy.
Where an intermediate size replaces a larger standard size, the assembly will take higher pressures, have greater flexibility and longer life at lower cost.
Intermediate Sizes
Standard Sizes
5/16
13/32
5/8
7/8
3/16
1/4
3/8
1/2
3/4
1
Follow the big name manufacturers of heavy duty equipment . . . Specify GENERAL HOSE — custom-engineered to each requirement.
GENERAL
HOSE AND COUPLING CO.
409 BROAD AVENUE • PALISADES PARK, N. J.

Circle 73 on Reader Service Card

THE FIRST HYDRAULIC PRESS WAS A BRITISH INVENTION BY JOSEPH BRAMAH, AND THE FORERUNNER OF ALL HYDRAULIC PRESSURE MACHINES



BRAMAH PRESS 1795

The HYDRAULIC ASSOCIATION of Great Britain

94/98 Petty France, London, S.W. 1 England

Post Scripts of Industry

continued

Vickers Incorporated will construct a new engineering and administration building to be located on a 76-acre site in suburban Detroit. The new 150,000 square foot building will house a modern research and development laboratory, engineering facilities, as well as some executive and sales offices. The new structure, which the company hopes to occupy in early 1956, will incorporate the latest architectural features to improve working conditions.

Dowty Nucleonics Limited is the new title of Davis, Wynn and Andrews, which has recently been acquired by the Dowty Group in England.

PROTECT YOUR HYDRAULIC SEALS with the IMPROVED Seal-Guard®

Here is a BETTER WAY to insure long life for cylinder rod packings, bearings, machine spindles, guide pins.

Seal-Guard's flexible bronze, knife-edge wiping rings mould themselves to the shaft contour . . . peel off dirt and grime . . . lift it entirely away from the shaft—no packing or crowding under.

- No chance of fouled bearings or packing.
- Can't damage shaft surfaces.
- Seal-Guards are available to fit rod diameters from ½ to 10 inches. Other sizes by special order.

Write for descriptive literature.

HYDRAULIC ACCESSORIES CO.
24301 Hoover Rd. Van Dyke, Mich.

NEW GAST Model 0211 AIR PUMP weighs ⅓ less — is a truly

COMPACT COMPONENT

This *new* Gast rotary-vane Air Pump offers many advantages, including: ⅓ less weight — (now 22 lbs.) — with more compact, streamlined design. Rotor mounted on new G. E. Form "G" motor shaft. Vanes give positive, pulseless air delivery. Rubber-cradled mounting dampens vibration, increases quiet.

Model 0211 produces up to 25 p.s.i. or 27" vac., or 1.3 c.f.m. running open. ⅛ h.p. motor uses only 3.8 amps. Ideal for automatic machines, industrial instruments and controls. Present uses: paper feeding in packaging, printing frames, or as portable laboratory air source.

Let *your* product benefit from this compact component — *write for Bulletin 1254 and "Application Ideas" Booklet!* Gast Manufacturing Corp., P.O. Box 117-D, Benton Harbor, Michigan.

Original Equipment Manufacturers for Over 25 Years

GAST ROTARY
- AIR MOTORS TO 4 H.P.
- COMPRESSORS TO 30 P.S.I.
- VACUUM PUMPS TO 28 IN.

See Our Catalog in Sweet's Product Design File

Circle 72 on Reader Service Card

Circle 56 on Reader Service Card

Worthington Corporation has appointed **J. H. Loomis** as manager of their St. Louis office. He was previously with the Chicago district office. **P. A. Mack,** St. Louis office manager for 23 years, was appointed special representative working on special assignments. Mack has been associated with the organization for 40 years.

John C. Cotner has resigned as president and general manager of **The Hydraulic Press Manufacturing Co.** Cotner, who has headed the company for five years, will remain as a director.

Joseph I. Bosi has become chief engineer of the **Hydro-Line Manufacturing Company.** A graduate of the University of Illinois, Bosi has been associated with the company since 1950.

Joseph I. Bosi
Hydro-Line Mfg. Co.

John J. Fox has joined **Kinney Manufacturing Division, New York Air Brake Company** as vacuum systems engineer. He was previously assistant technical manager of Vacuum Industrial Appliances, Ltd. Glasgow, Scotland. **Z. Dobrowolski** has joined the division as project engineer. **William B. Mills** was appointed assistant sales manager of the company's Boston office. **Joseph P. G. Davis** was made Philadelphia district manager, succeeding Mills.

Lincoln Engineering Company has named **Robert E. Crean** manager of the company's industrial branch sales office in Philadelphia. He succeeds M. C. Hazenfield who retired.

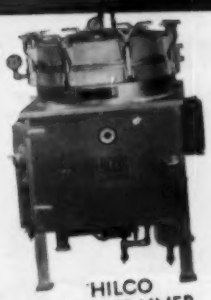
Continued on next page

Keep YOUR HYDRAULIC SYSTEM Clean with HILCO HYDRAULIC OIL FILTER

- No More Varnish and Sludge Deposits
- No More Flushing and Manual Cleaning
- No More Frequent Oil Changes
- No More Accumulation of Dirt

Filter life up to a year eliminates usual frequent draining, refilling of systems.

HILCO Hyflow Oil Filters trap dirt, acids, rust, sludge, gums, resins . . . all solid contaminants, and keeps your hydraulic system clean and in top running condition at all times. To you, this means longer oil life, reduced wear and abrasion . . . hence, less down time and lower maintenance costs giving you continuous equipment operation with increased production. Hydraulic unit sensitivity depends upon a clean system. HILCO Hyflow filters remove solids as soon as they enter the system and retain much of the moisture which enters the oil from the atmosphere and from condensation. Obtain the full capacity and economy of your equipment by keeping it in top running condition with HILCO. Hydraulic Oil Filters come in stationary or portable models. They can be hooked into hydraulic systems without interrupting equipment operation.



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For complete oil reclaiming. Removes solids, acids and volatile impurities; moisture, solvents, gasses, etc., from hydraulic fluids by heat-vacuum process.

• SEE FOR YOURSELF HOW HILCO keeps your Hydraulic System Clean . .

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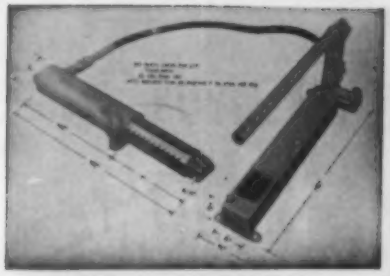

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(PATENTED)

"Hydro-Latch" Remote Control Hydraulic Rams of capacity or size to meet any requirements with built-in spring loaded safety latch, self-engaging as the ram travels out—either clevis or flange mounted. The rams will not rotate. Manually or mechanically operated. Standard size: 10 tons, 7 inches of travel. We solicit inquiries to fit your application.

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Post Scripts of Industry
continued

The NFPA Team: Officers and directors of the National Fluid Power Association at the Second Annual meeting, Broadmoor Hotel, Colorado Springs, Colo. Back row, left to right: Elwood G. Peterson, Treasurer; Lloyd R. Burger, Director; R. J. Murphy, retiring Director; Barrett Rogers, Executive Secretary; E. E. Yaggy, Jr., retiring Director; L. H. Schuette, Director; B. R. Teree, Director; front row: L. S. Barksdale, Director; W J. Donnelly, Director; John E. Erskine, incoming President; Ben N. Ashton, retiring President; O. Wendell Macy, incoming First Vice President; John J. Pippinger, incoming Second Vice President and John A. Marsh, Director.

Use PERMASEAL Piston Rings for Hydraulic and Pneumatic Applications

Hydraulic and air cylinders need the dependable sealing features found in Permaseal Rings. Years of ring manufacturing experience assure you of a product precision made for long life. Check the features below for outstanding characteristics of Permaseal Piston Rings.

PERMASEAL FEATURE: Permanently leak-proof joint that remains leak-proof even after many thousands of hours of service UNIFORMITY: Manufacturing methods result in perfect round rings—accurately made to your specifications and carefully tested. ASSEMBLY: Ring seals equally well in both directions—this eliminates possible errors in assembly—enables use of fewer rings per cylinder SERVICE: An adequate inventory of ring blanks is maintained to assure prompt delivery on Rush items and to meet shipping dates on production orders MATERIAL: Permaseal rings are made from the finest grade of gray iron available; recognized as the best material known for long wear and constant wall pressure characteristics ECONOMY: The low initial cost and long service life of Permaseal Rings give you unusual economy.

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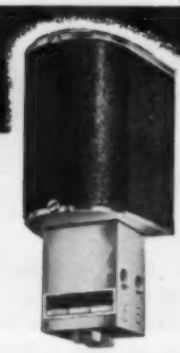
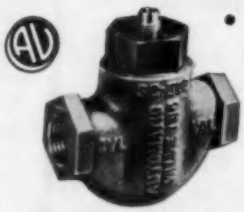
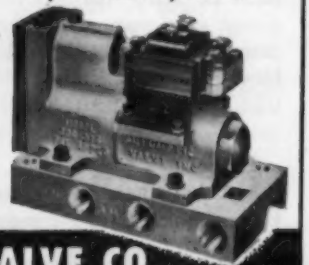
PILOT VALVES
3-WAY 4-WAY
For operating Master Valves and Small Cylinders





***Speed Control* VALVE**
Controls speed of Air and Hydraulic Cylinders

***3-Way and 4-Way* VALVES**
Pilot Operated
Sizes ¼" — ⅜" ½" and ¾"
Write for Bulletin



AUTOMATIC VALVE CO.
37423 GRAND RIVER AVE., FARMINGTON, MICH.

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Earl Hobein was appointed plant manager of the **Berea Rubber Company.** This plant manufactures O-rings for the Rubber Products Division of Parker Appliance Company. Hobein joined Parker five years ago as process engineer, later became assistant to director of research and subsequently was promoted to assistant to the sales manager of the company's Rubber Products Division.

Lowell J. Carr has joined **Cook Electric Company** as sales engineer. Carr, formerly sales engineer with Aero Engineering Company, will be attached to the Dallas office.

The Rucker Co., appointed Howard C. Zintz as chief engineer. Prior to this appointment, Zintz was hydraulic engineer with the Corning Glass Works, and previously also served as hydraulic and electrical engineer with the Consolidated Machine Tool Corp.

Howard C. Zintz
The Rucker Company

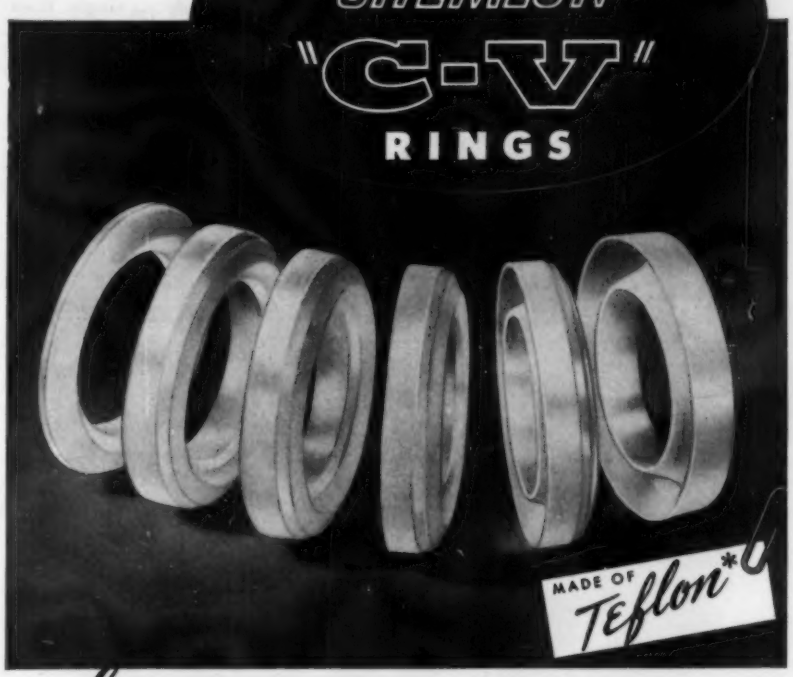
Promotion of **Cecil Latham** to assistant superintendent of **Fulton Sylphon Division, Robertshaw-Fulton Controls Company** has been announced. With the company since 1923, Latham started in the assembly department and moved up through the ranks to his present position.

A. Craig Hood, George E. Clauser and **Charles C. Mathews** have joined the technical division of **Superior Tube Company.** They have been assigned to the company's metallurgical laboratory.

Continued on next page

Pack more performance into your hydraulic systems

WITH JOHN CRANE
CHEMLON®
"C-V"
RINGS



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"John Crane" Chemlon "C-V" Ring special cross sectional design affords effective sealing at practically finger-tight gland pressure.

To bring you all the important advantages of Teflon for your hydraulic sealing applications, "John Crane" has developed a complete line of Chemlon "C-V" Rings and male and female adapters. If you have special requirements, additional sizes can be molded to fit your stuffing box dimensions.

"John Crane's" illustrated booklet "The Best in Teflon" contains extensive information on a wide variety of Chemlon Products. Send for your free copy. Crane Packing Co., 1805 Cuyler Ave., Chicago 13, Ill.

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JOHN CRANE CRANE PACKING COMPANY

Post Scripts of Industry
continued

Hydraulic Unit Specialties Co., Waukesha, Wisconsin, is building a new factory which will double their present production facilities. This will be the second expansion for the company within six months, their new factory was completed late in 1954. The new structure of modern, single floor design will provide more space for engineering and laboratory work as well as office space. According to **D. J. Schneider,** president, the new expansion is the result of greatly increased use of hydraulics by industry.

through GAR precision orifices

*P*recision *Gar-formed* orifices, manufactured by Gar's exclusive *electroforming* process, account for the superior flow control of Gar hydraulic components. No other process gives such clean, sharp orifices, so precisely sized and accurately identical. That's why no other restrictors, valves, or similar units match Gar's uniform, predictable flow characteristics.

Along with superior orifice design and performance, you'll find other advanced features in Gar products. Self-cleaning operation, corrosion-resistant materials, and precision manufacture throughout mean components that easily meet strictest standards for performance and service.

When you specify Gar hydraulic components, you are assured the smooth, reliable, control that only Gar precision orifices can provide.

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To cover a full range of pressure and temperature ratings

Send today for full information GAR PRECISION PARTS, INC.
3 LUDLOW STREET, STAMFORD, CONN.

Peter F. Hurst, president, **Aeroquip Corporation,** announced the acquisition of **Marman Products, Inc.,** Los Angeles. Marman Products manufactures clamps widely used in the aircraft industry for joining pipes and other conduits. This acquisition is another step in Aeroquip's program of expansion and diversification.

Wallace B. Leyda has joined **Ohio Seamless Tube Division** of Copperweld Steel Company as chief metallurgist. He was previously associated with Northern Indiana Brass Company.

Robert E. Amidon has been named sales representative for the Graton & Knight Company to cover the Virginia, West Virginia and western Pennsylvania territory. Amidon, who was formerly with the Heald Machine Company, will operate out of Pittsburgh.

Robert E. Amidon
Graton & Knight Company

Paddon Company, since 1953 exclusive sales representatives in the Youngstown, Ohio area for products made by the American Flexible Coupling Company, have expanded their operation to include the Pittsburgh and Cleveland territory. They will be assisted by **K. P. Nagel** who recently joined the company.

Dane E. Smith was appointed as application engineer to the Houston, Texas, district office of **Vickers Incorporated.** Prior to joining Vickers in 1953, Smith served for three and one half years as a sales engineer with The Budd Company.

Promotions for two members of the Aircraft Products Division of **The Aro Equipment Corporation** were announced. **D. W. Orrick,** formerly with the Aro Aircraft Sales Division in Los Angeles and lately as eastern regional manager, was named sales manager of aircraft products. He will headquarter at the Bryan, Ohio, plant. **R. B. Blythe** was promoted to assistant to the vice president. With several years experience as senior engineer and sales manager, Blythe will now direct activities relating to the sale of new aircraft products.

D. W. Orrick
The Aro Equipment Corp.

M. Nielsen
The Babcock & Wilcox Co.

The board of directors of **The Babcock & Wilcox Company** elected vice president **M. Nielsen** to the newly created post of executive vice president. Nielsen joined the company in 1924, has had wide experience in the contract and manufacturing departments, and was elected a vice president in 1953.

Industrial Equipment Co., Joplin, Missouri, was appointed by the Parker Appliance Company as distributor for O-rings.

TUTHILL SIMPLIFIES PUMP SELECTION

New Cataloging Plan Provides Practical Short-Cuts to Pump Specifications — Helps You Pick The Right Pump for the Purpose

If Your Specifications Call for Pumps for...

- LUBRICATION
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- TRANSFER
- CIRCULATING
- BURNING OILS

In capacities from 1/3 to 6 g.p.m. and pressures up to 600 p.s.i.

...Write for Tuthill Catalog 101

Catalog 101 presents complete data on the Model L series of mechanically-sealed, rotary, internal-gear positive displacement pumps.

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Dependable Rotary Pumps since 1927
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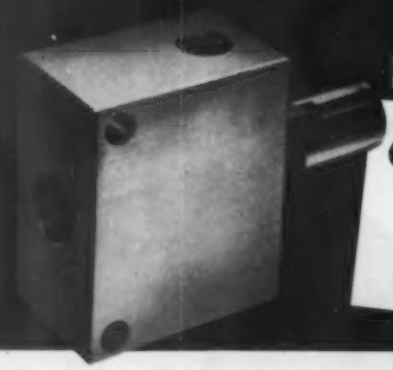
Divide a Pump Output

With a FLUID CONTROLS



Combination Bypass & Restrictor Type Flow Regulator

With this new Flow Regulator, one large pump can supply fluid for two or more circuits. One circuit will have a constant regulated flow; other circuit will receive balance of pump output.

- Constant flow in one circuit regardless of pump output
- Considerable savings over use of separate pumps
- Long troublefree service

Write for complete specifications and prices.

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Manufacturers of Hydraulic Valves and Devices

Relief Valves • Check Valves • Restrictor Valves
Needle Valves • Pilot Check Valves • Special Valves
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- Adjustable to Your Pressure Range
- Economical Price

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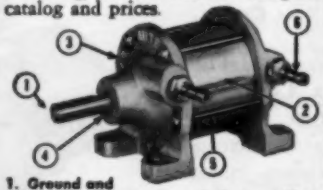
AIR-MITE Cylinders—made in single or double acting series—in 4 mounting types, are high quality cylinders at a low price. Simple, rugged design and compact construction give them long life, permit easy mounting on jigs, fixtures, tools, or machines. Used wherever power holding, pushing, pulling or lifting is required, AIR-MITE cylinders will meet your most exacting standards of dependability and long life. Write for complete catalog and prices.



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3. High strength aluminum alloy cylinder heads
4. Bronze oilless ram bushing
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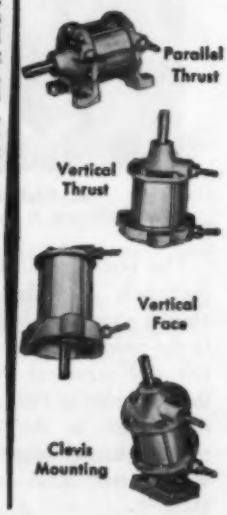
6. Brass hose stems

4 Mounting Types



AIR-MITE Devices, Inc.

4415 W. CARROLL AVENUE • CHICAGO 24, ILLINOIS

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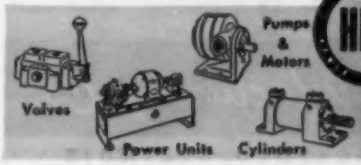
Buying component parts from one supplier can save a lot of time and trouble . . . less correspondence, a single responsibility, coordinated shipments are only a few of the many advantages. H-P-M's complete line of pumps, power units, valves, cylinders and system accessories can become your standard. This complete service plus H-P-M's experience background in the design and building of hydraulic systems can be a really major "assist" when needed. Write today for a complete catalog and get the facts on single source savings. Ask for Bulletin 1101.

1084 MARION RD.

HYDRAULIC PRESS MFG. COMPANY
MOUNT GILEAD, OHIO, U. S. A.



HYDRAULIC POWER DIVISION

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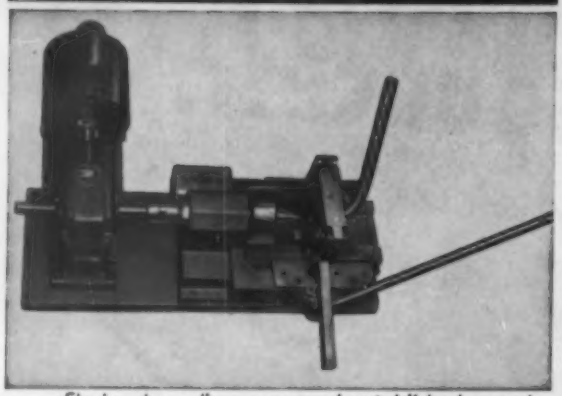
"POWER-FLARE"



Flaring by roll process and established speed, the "Power-Flare" machine has greatly improved the flare of all types of tubing used in hydraulic systems.

It gives a smooth, always uniform, surface for seating; the metal is not work hardened near the danger point; and by creating a burnished surface, tool marks, scratches and burrs are eliminated.

One size machine flares steel, copper, aluminum and stainless steel from ⅜" OD. to 2" OD. Dies for 30, 37 and 45 degree angle fittings are available.

Numerous users have expressed complete satisfaction. "Power-Flare" has been proven in the field for over five years.

Immediate delivery.

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use... Hydro-Line CYLINDERS

SERIES "J" CYLINDERS

for rugged, trouble free service

- *CARTRIDGE . . . rod-wiper, packing, bushing in one unit.*
- *RUGGED BODY . . . all steel end caps and barrel.*
- *PISTON RINGS . . . step-cut joint, sealing in both directions, long life, minimum leakage.*
- *PRESSURE . . . 2,000 psi heavy-duty . . . 3,000 psi non-shock.*
- *SIMPLICITY . . . no tie-rods . . . no retainer rings.*

Write for Bulletin No. 53

Hydro-Line Manufacturing Co.

5605 PIKE ROAD • ROCKFORD, ILLINOIS

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Now stocked at all Garlock Branch Warehouses

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GARLOCK

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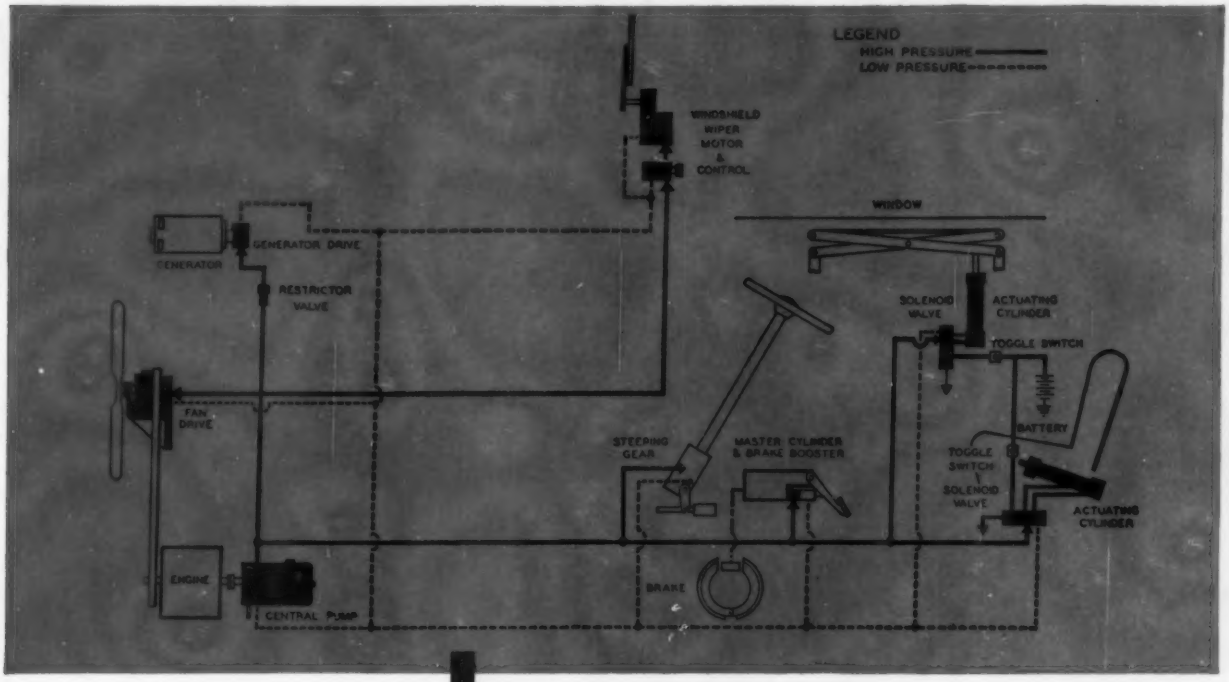

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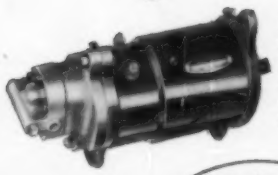

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